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Photo: Marcia Maues

POLLINATION INTENSIFICATION AS AN OPPORTUNITY FOR SUSTAINABLE AGRICULTURE IN BRAZIL

POLICY BRIEF

HIGHLIGHTS

- Assessing pollinator supply and demand is a useful tool for designing landscape management strategies to improve agricultural productivity, food security and biodiversity conservation;
- Rural properties with conserved natural areas and biodiversity-friendly agricultural practices benefit more from crop pollination and contribute to the conservation of biodiversity in the country;
- Adapting rural properties to the **Native Vegetation Protection Act** is an opportunity to promote pollination services to crops by restoring degraded areas. It is a win-win strategy: Crop production is increased without expanding cultivated areas and with greater sustainability.


Photo: Jana Souza

POLLINATION SERVICES AND AGRICULTURAL PRODUCTION

Animal pollination leads to increased agricultural production and, therefore, generates monetary returns for producers. In Brazil, the direct value added generated by the **pollination service** is around 43 billion reais/year (2018 data).

Pollination services demand is measured by the degree of **dependence on pollinators** for each agricultural crop and its cultivated area. The supply of pollination is represented by the amount of natural vegetation area. At the same time, the pollination flow takes into account the movement of pollinators from supply areas to crop areas. With these information, it is possible to assess pollination service provision and define farm-level landscape planning. This will ensure that the pollination services supply is adapted to the demand, thus benefiting agricultural productivity, food security and biodiversity conservation. And it can also lead to indirect benefits for the producer, such as certification and access to markets with higher environmental requirements.

POLLINATION SUPPLY AND DEFICIT IN THE COUNTRY

The presence of native vegetation around crops is essential to provide floral resources (food) and nesting sites to sustain pollinator populations. Therefore, rural properties with conserved natural areas and biodiversity-friendly agricultural practices benefit more from pollination in crops and contribute to the conservation of biodiversity in the country.

The relation between the demand for pollination and the **deficit of natural vegetation** in each municipality - i.e., the difference between the amount of existing natural vegetation and the areas required by the law for the protection of native vegetation - enable to verify which municipalities have a pollinator supply deficit. Adapting rural properties to the **Native Vegetation Protection Act** is an opportunity to promote pollination services to crops by restoring degraded areas. It is a win-win strategy: Crop production is increased without expanding cultivated areas and with greater sustainability.

Brazil has different socio-economic and agricultural profiles related to pollination services. The highest demand for pollination occurs in municipalities with large farms, more access to rural credit, and proportionally higher expenditures on pesticides and fertilizers. Intensive agricultural practices may reduce pollination in these areas. Whereas, municipalities with a predominance of small properties and diversified agricultural production have lower spending on pesticides and fertilizers, reconciling agricultural production with biodiversity conservation. In this context, environmental and agricultural policies and programs must include pollination and take into account the specificities of each location.

Pollination service: pollination is the ecological process of transferring pollen between flowers. Most plants are pollinated by animals such as bees, flies, butterflies, hummingbirds and bats. It is a regulating ecosystem service and its provision depends on the relationship between demand, supply and flow, influenced by the availability of natural areas.

Pollinator dependence: is the extent to which agricultural production is enhanced by the action of pollinators. This ranges from essentially dependent crops (such as cacao and apples - increase over 90%), with high dependence (over 40% to 90%, such as acai and canola), modest dependence (over 10% to 40%, such as soy and coffee), to low dependence (up to 10%, such as beans and tomatoes).

Native Vegetation Protection Law: LPVN (Law 12.651/2012), it is a Brazilian law that regulates the use and protection of forests and other types of native vegetation on rural properties. Its main mechanisms are the Permanent Preservation Areas and the Legal Reserves.

Photo: Ana Laura Dutra

POLLINATOR CONSERVATION AND AGRICULTURAL PRODUCTIVITY: A WIN-WIN GAME

Pollinators depend on natural areas for food (nectar and pollen from flowers) and nesting. Each species has different needs and restored or regenerating areas must be highly diverse to ensure year-round flowering and adequate habitat (shade, microclimate, water). Searching for food requires energy expenditure and plantations located closer to natural areas receive a more intensive pollination service. Therefore, restoration can bring more pollination to agricultural areas and comply with the law.

Brazilian cities such as Anápolis (GO) and Alta Floresta (MT), which are under soybean expansion, Ilhéus (BA) located in the cocoa region, or Itapeva (MG) placed in the coffee region, are examples of pollinator-dependent agriculture and high vegetation deficit. They are examples of high-priority sites for natural vegetation restoration aiming to increase pollination services. Apuí (AM), Xique-xique (BA) and São Félix de Balsas (MA) are highly pollinator-dependent agriculture cities, but they have low vegetation deficit. These municipalities are recommended to preserve natural areas to ensure local agricultural production and pollinator biodiversity.

Natural vegetation deficit: is the difference between the amount of native vegetation within each property and the minimum required by the LPVN, according to the Rural Environment Registry (CAR). This deficit must be restored by rural producers through processes that allow the recovery of degraded areas.

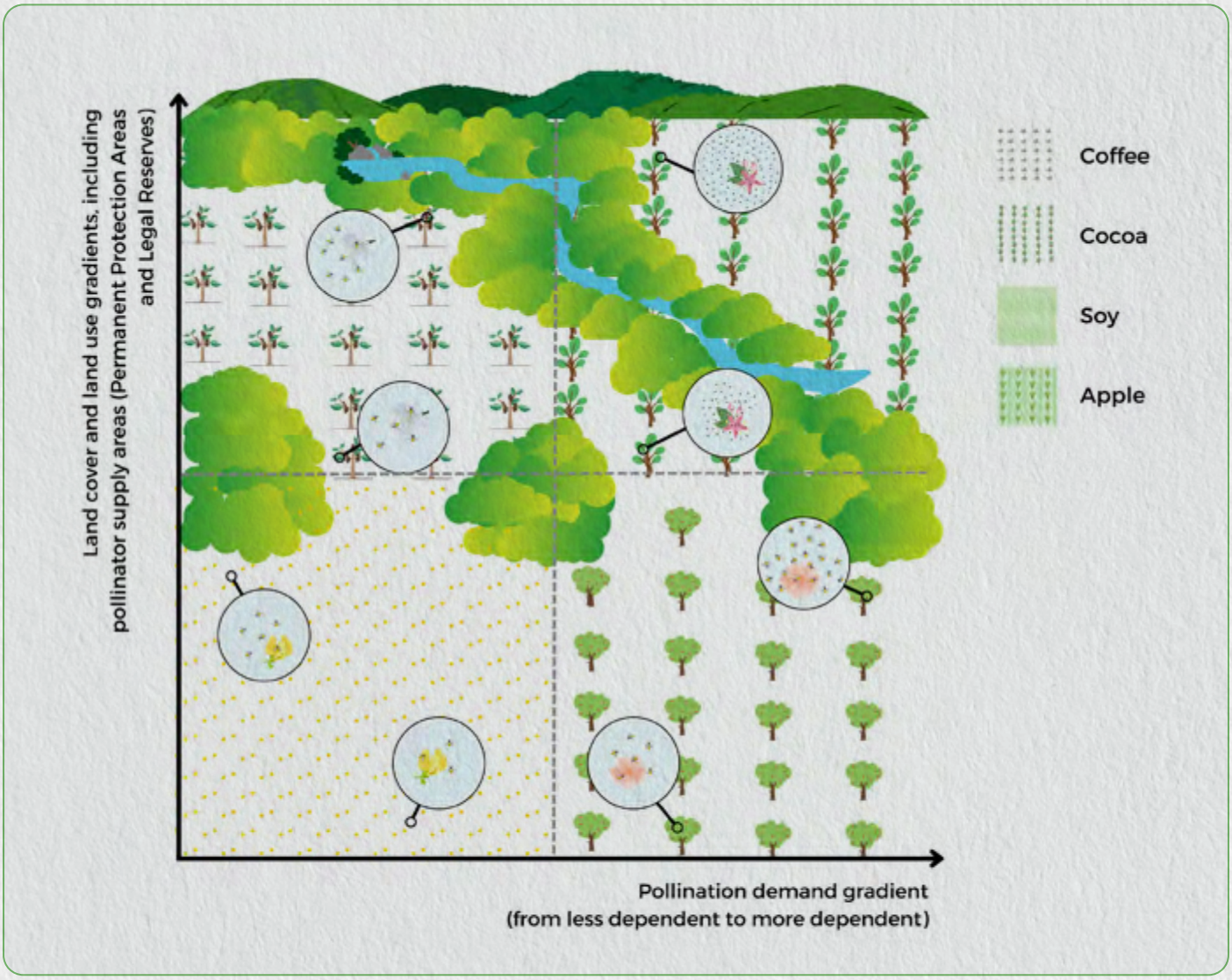

Figure - Landscapes have gradients of land cover and land use where natural areas provide pollinator habitats, such as Permanent Preservation Areas and Legal Reserves. These areas are considered pollinator supply areas. While cultivated areas represent a gradient of pollinator demand, as agricultural crops are more dependent on pollination services to ensure production. Thus, the flow of pollinators between supply and demand areas results in the provision of pollination services to crops, and the closer the crops are to natural areas, the higher the pollination intensity.


Photo: Jana Souza


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RECOMMENDATIONS

- Enhance policies that encourage the purchase of agricultural products from properties that comply with the Native Vegetation Protection Act (LPVN), such as through the Food Purchase Program (PAA) and the National School Lunch Program (PNAE).
- Prioritize incentive lines in rural credit programs for rural properties that comply with the LPVN.
- Create or expand access to rural credit to promote biodiversity-friendly agricultural practices, including restoration of degraded areas.
- Implement the pollination valuation parameters for environmental services payments already foreseen in the National Policy for Payments for Environmental Services (Law 14.119 of 2021).
- Expand technical assistance training for rural producers (on-site and remote courses, field days, content for social networks), including actions that take into account pollination ecosystem services and biodiversity-friendly agricultural practices.
- Involve academic and non-academic public and private sector actors (farmers, extension agents, environmental and financial agents) to enable solutions based on the co-production of knowledge.

ABOUT THE PROJECT

SPIN's main objective is to identify priority areas for conservation and restoration of plant-pollinator interactions to maximize agricultural productivity and biodiversity conservation on a national scale. Its multidisciplinary team integrates different perspectives to generate useful products for society.

ABOUT SinBiose

The Brazilian Synthesis Center on Biodiversity and Ecosystem Services (SinBiose) supports the development of knowledge synthesis to tackle current issues in biodiversity and ecosystem services. The initiative is led by CNPq, with the support from the Ministry of Science, Technology and Innovation (MCTI) and state research foundations. Learn more at www.sinbiose.cnpq.br

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