



Partnerships for  
**Forests**

**Restoring  
degraded lands  
in tropical  
forests:**

How the Seed Paths  
Initiative is enabling  
forest restoration  
pilots in Brazil

November, 2020



# Introduction

The Brazilian Forest Code requires farmers in Brazil to protect or restore a percentage of riparian areas (the area around river banks) and forest reserves based on the size of their land and the biome where their farms are located. However, there are major technical and economic challenges to forest restoration in Brazil. Since highly degraded land limits the natural regeneration of these areas, there is often a need for active restoration efforts, traditionally done with the planting of seedlings. But the associated costs, lack of technical know-how and limited legal enforcement discourages farmers and prevents restored areas from providing essential ecosystem services.

While agricultural production activities such as the planting of soya and corn count with broad access to technical assistance services, provided normally by input suppliers in those value-chains, forest restoration lacks wide spread, specialised support in the field. When considering the application of not widely known approaches such as the use of direct seeding techniques, adapted to local conditions, the challenge of technical assistance is even bigger, with fewer options for more tailored and agile support.

The Seed Paths Initiative is a multi-stakeholder group that is working to scale-up restoration in Brazil using direct seeding techniques (traditionally known as “muvuca”). This approach is more cost-effective than the planting of seedlings, the most common restoration method currently used in Brazil. The Initiative contains a network of specialists, from technical assistance providers to scholars specialised in forest restoration who have been improving the methodology and creating a body of knowledge and technical support of how to apply the technique in different conditions.

Between 2019 and 2020, the Initiative has supported the development of 38 direct seeding restoration pilots in diverse environments such as the Amazon, Cerrado and Atlantic Rainforest biomes. With support from Partnerships for Forests (P4F) the Initiative has supported the implementation of the technique in two pilots within Forest Partnerships projects in the Amazon biome : (1) as part of the work being done by Pecsa -- an innovative cattle ranching business that supports sustainable cattle production, and; (2) The Nature Conservancy's (TNC) Cocoa Agroforestry Restoration project, that improves smallholders' cultivation of cocoa.

# From theory to practice: how the Seed Paths Initiative is enabling restoration pilots in Brazil

Active forest restoration is expensive. According to the Brazilian Nationally Determined Contributions, the country needs to restore 12 million hectares of forests by 2030, which represents an estimated annual investment of between GBP 500 and 900 million per year<sup>1</sup>. Along with this figure, estimates based on the Forest Code shows there are 21 million hectares<sup>1</sup> of liabilities within private areas that need to be restored back to their native vegetation. Therefore, there is a need of cost-effective solutions that can be scaled, such

as the direct seeding technique. The technique has multiple benefits including: (1) a lower price tag - direct seeding can be as little as one third of the price of traditional restoration methods; (2) easier implementation - existing agricultural equipment such as tractors, agricultural implements and existing seeders can be used, making it easier for farmers to use; (3) demands less soil management, and; (4) provides livelihoods for seeds collectors' that can be particularly important in economically disadvantaged communities<sup>2</sup>.

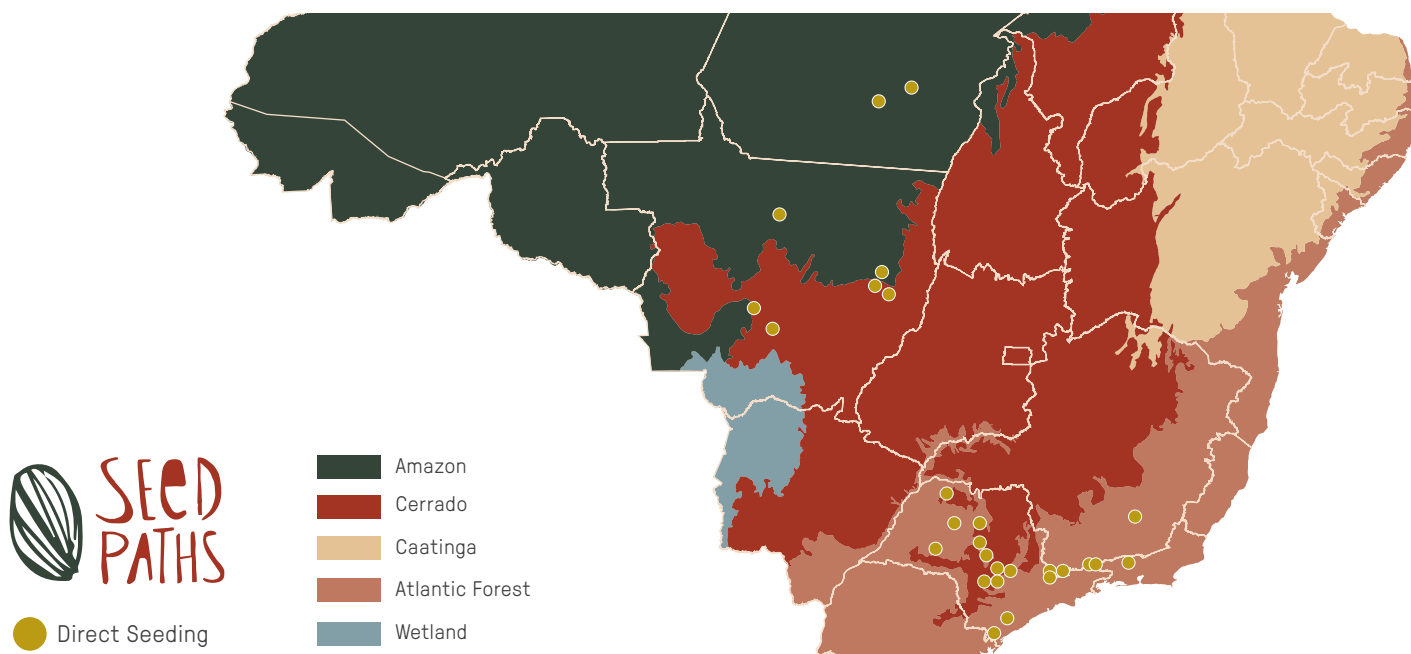
## Tropical forest land, a fragile ecosystem<sup>3</sup>

Although most references to tropical forests highlight the richness of these ecosystems, in reality they are incredibly fragile. For instance, soil fertility in tropical forests is normally quite low and the biodiversity of plants relies on the thin layer of organic matter composed of fallen leaves, branches and organisms as their main source of nutrients. In Brazil, these forests are under constant pressure of degradation and deforestation for agricultural production which greatly interferes with the ecosystem's balance. In these ecosystems, trees safeguard the natural surface layer from tropical rain showers and radiation from the

sun. If trees are removed then exposure to the rain and sun causes nutrients in the soil to be washed away or degrade due to high temperatures. In these conditions natural regeneration is not possible and active restoration methods (such as direct seeding) are necessary.

In 2019 the Seeds Path Initiative established a one-year action plan that ran from October 2019 and resulted in the development of direct seeding restoration pilots through the provision of technical assistance

**Figure 1. Locations of the 38 Restoration projects supported by the Seed Paths Initiative<sup>4</sup>**



# How technically challenging is Direct Seeding?

Even with several economical and ecological benefits, direct seeding restoration is not trivial. In addition to the challenge of finding seed suppliers, individuals looking to adopt the technique also face technical barriers (Figure 2).

There is no “one size fits all” solution for direct seeding. It is a technique under constant improvement, building on experiences in different contexts, by different actors from different backgrounds. Without adequate assistance to choose the direct seeding method that is most tailored for their conditions, most farmers struggle with its application which can compromise the results of restoration. The challenge is greater for farmers with zero or few available alternatives to technical assistance services. Therefore, initiatives such as the Seed Path’s Initiative, can be essential for helping them improve technique, register lessons and share experiences with other farmers and stakeholders.

**Figure 2 - Challenges faced by the farmers in different stages of direct seeding**



## PLANNING AND PREPARATION

- Analysing the area to be restored (soil, weather conditions, terrain)
- Choosing the most adequate species for the area that will be restored
- Planning the steps and resources necessary for restoration activities based on existing conditions and availability of tools



## PLANTING SEEDS

- Adapting agricultural machinery and implements for native trees’ seeds and sub-perennial shrubs as seed coverage
- Performing direct seeding correctly with good soil tillage, adequate sewing depth, and in the correct season of the year



## MONITORING AREAS

- Checking the area for invasive species that compete with the young seedlings
- Checking the area for pests and diseases that can affect the development of the restoration
- Keeping the area isolated from cattle and other animals that can stamp over young seedlings
- Checking for indicators of good development of the area, if trees are growing as expected and if there are other problems affecting the restoration



## REVISING THE APPROACH

- Establishing the correct measures to undertake in order to overcome challenges for the restoration.



# How the Seed Paths initiative provides direct and remote technical assistance for the usage of the direct seeding technique

The Initiative's technicians provide support across all restoration stages, from the initial local diagnosis that involves establishing an appropriate list of species and adequate direct seeding methodology to the more complex operational activities such as planting, intermediate observation of results and final assessments.

Due to Covid-19, in-person activities have not been possible and have had to be delivered virtually since the start of the pandemic. The initiative adapted the monitoring protocols for the local farmers and the farms' staff members, allowing for non-specialists to follow and report on progress in the restoration sites. The technical team continued to provide individual remote support for each field technician through Whatsapp -- a cross platform global messaging service primarily used on mobile phones. Technicians working in different contexts could also continue exchanging experiences and lessons learned through the platform. Monthly meetings have also moved virtually, allowing technicians to share insights and provide recommendations at different stages.

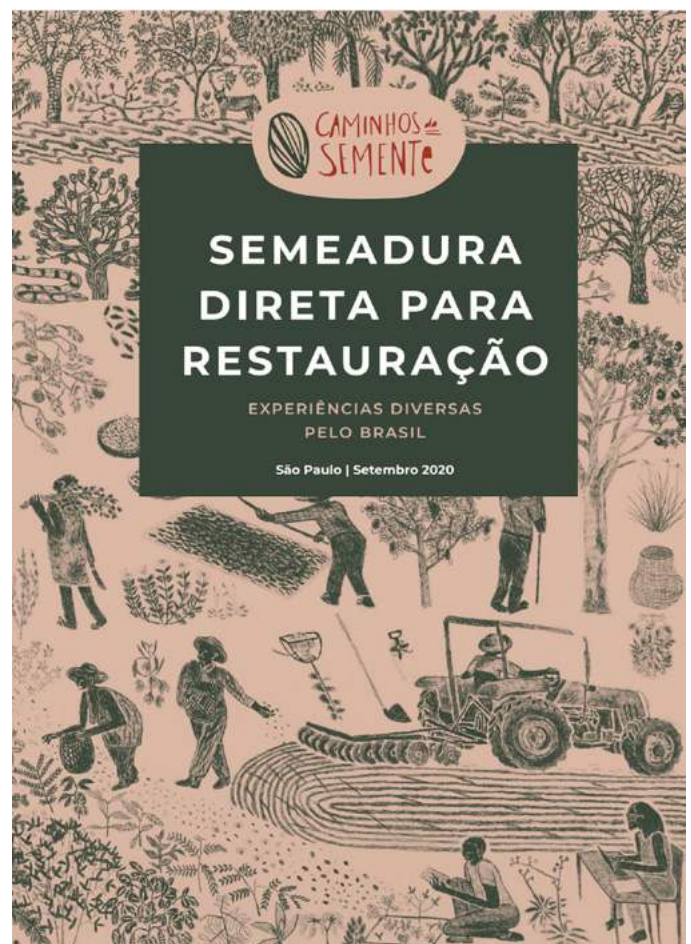
*“I believe direct seeding is a real game changer. I used to work with seedlings, and forest restoration projects cost twice as much as with direct seeding, not to mention the added logistics concerns. Direct seeding is much more likely to be successful when working with farmers”*

Thais Ferreira Maier – TNC Restoration Specialist

In September 2020 a report shared lessons learned in the implementation of the 14 advanced pilots (Figure 1). It shared experiences and economic and technical information about

the implementation of the technique by different stakeholders in different biomes and socioeconomic contexts. While the general technique of direct seeding has been applied in many countries in the past, in Brazil it has only been taken up in the last two decades, mixing experience from scientific and traditional knowledge. The 14 pilots presented in the report represent reforestation projects with direct seeding in three Brazilian biomes: Cerrado (Brazilian Savannah), Atlantic Rainforest and the Amazon. The different contexts in which the pilots were carried out reveal the potential of applying the method across Brazil. The report shares practical examples of how combined efforts between private sector, government and non-governmental organisations are overcoming challenges, generating learning and enabling the regeneration and recovery of native vegetation across the country.

**Figure 3:**  
**Direct Seeding for Restoration:**  
**Multiple experiences in Brazil**





# Pecsa Restoration

Located in the agriculture frontier of the Amazon biome, Pecsa is an innovative business that supports ranchers to transition from an extensive, unsustainable and unproductive cattle ranching system to becoming a more intensive and sustainable system that protects forests, restores degraded land and generates greater income. The model works by setting-up partnerships with ranchers and taking full control of farm operations in order to improve pasture management, train employees on best practices and restore liabilities of degraded land according to the Brazilian Forest Code.

Pecsa works with ranchers that have degraded lands and which demand active restoration activities. The model allows PECSA to trial new restoration methods that can reduce operational costs. With support from the Seed Path's Initiative, Pecsa is not only piloting restoration methods to improve financial performance but also contributing to

the evidence that direct seeding is a feasible technique for ranchers moving towards legal environmental compliance.

Pecsa began working with cattle ranchers in Brazil's mid-western municipality of Alta Floresta, Mato Grosso, in 2016, assisting them with on-farm diagnoses to determine restoration of riparian areas required by Brazilian regulations. One of the immediate benefits from the programme was providing clarity on the actual areas needed to be restored on each property. Unsupported by on-site diagnosis, property assessments were previously unreliable. Ranchers were informed of the amount of area requiring forest restoration based on assessments using publicly available satellite imagery. These data lacked the precision to identify the exact course of the river streams, whether a streambed existed at all and the state of existing vegetation along its banks.

Photos PECSA





## **POINT OF VIEW OF TECHNICIANS ON THE GROUND**

### Thiago Farias, environmental manager at Pecsca

Thiago Farias, a forestry engineer and environmental manager at Pecsca, says the lack of precision led to restoration requirements being overestimated: “For example, some producers received assessments indicating a requirement to restore 100 hectares of riparian areas, but when we conducted our on-site assessment, this went down to less than 30 hectares,” explains Farias. “In addition, ranchers are unaware of what areas are already undergoing natural regeneration, the condition of areas requiring restoration and what is needed for restoration work to be successfully completed,” he says. The lack of high-quality information discourages farmers from investing in forest restoration.

#### **What are the biggest challenges in forest restoration on private properties in the Amazon?**

People are often little aware of farmers’ operating conditions. Our partner ranchers were initially unable to provide an estimate of how much revenue their operations were generating per hectare. The lack of information made it difficult to get buy-in into forest restoration. We begin by providing compelling figures and clarity around actual costs, demonstrating that forest restoration is possible, and then provide the support to make it happen.

#### **Could you describe your first experience using the direct seeding method?**

The first experience we had using seeds for restoration at PECSA, I have to admit, was less than positive. Without adequate instruction, we made a lot of mistakes in our method of soil preparation, planting, and post-planting maintenance. I had previously visited areas in the Xingu river Basin with the team from the Xingu Seeds Network, and had seen very positive results at relatively low costs, but we were used to planting seedlings rather than using seeds.

#### **Could you describe your initial contact with the Seed Paths Initiative and the impact it has had on Pecsca’s forest restoration activities?**

When we were first contacted by the Seed Paths Initiative, we liked their approach. We discussed our experience with technicians from the Initiative, and they recommended a new way of applying the method. We then received support throughout the project, from highly dedicated technicians.

They always provided very fast responses to our questions, and shared a wealth of information on a WhatsApp group about direct seeding approaches for different types of land. Having access to technicians made the learning curve much smoother.

#### **What response have you had from ranchers about the process?**

A key aspect of direct seeding is its immediate visual impact. With seedlings, farmers slowly watch plants grow from 30 centimetres to one metre tall over the space of 6 long months. With direct seeding and green manure (natural manure using specific plant varieties), within 90 days the once-barren ground becomes green, and farmers think, “Wow! It worked!”. It is very encouraging. It also gives them a notion of how ecological succession works, such as how some species germinate

#### **What role can the Seed Paths Initiative play in the current context of forest restoration in Brazil?**

The Initiative has been highly successful at producing content and communicating effectively with a large number of technicians. It has also done a good job of breaking monopolies in forest restoration, a sector previously restricted to a handful of organisations and groups. Thanks to the Initiative, we now have a wide range of actors working together, from collectors through nursery owners to technicians and academic researchers. And the Initiative is able to communicate effectively with all of them.



# Cocoa agroforestry restoration

The initiative led by The Nature Conservancy is working to develop an economically feasible model to restore degraded lands through agroforestry systems developed by smallholders with cocoa as their main cash crop. The initiative is located in São Félix do Xingu (Pará State), the municipality with the largest cattle herd in Brazil and still one of the leading deforestation hotspots in the Amazon. The region contains an extensive amount of degraded land from abandoned pastures as a result of unproductive and unsustainable cattle ranching. Given the costs of ranching, cocoa production is proving an interesting alternative for smallholders that is growing as a result of the high demand from the market and the opportunity for people to diversify their incomes.

The initiative is piloting a technical assistance hub with the support from Olam Cocoa and Mondelez International testing models for providing technical assistance for smallholders. The objective is to support smallholders, most of which were previously small cattle ranchers, to implement agroforestry systems. The incentive: higher returns per hectare. The initiative also supports existing cocoa farms in small properties, by providing training on good agricultural practices and increasing carbon sequestration.

With around 14,000 hectares under improved sustainable management, the initiative has been working to restore degraded riparian areas and abandoned pastures in small farms. This is done through the piloting of new restoration approaches that are cheaper and suited for the specific conditions.

Photos TNC e Juliana Tinoco







## POINT OF VIEW OF TECHNICIANS ON THE GROUND

### Thais Ferreira, forest restoration specialist at TNC

The Cocoa Agroforestry Restoration programme, in partnership with the Seed Paths Initiative, recently provided training on direct seeding implementation on two properties participating in the programme. Thais Ferreira, a forestry engineer and a member of the project team, says the restoration project was a success, and further investment is expected in continued deployment of direct seeding, including in agroforestry systems.

#### Could you describe your experience with the Seed Paths Initiative?

Direct seeding was a method we were already considering. But our interaction with the Seed Paths Initiative was a tremendous learning experience – their technicians are very good at what they do. Seed Paths has become the go-to organisation for direct seeding. They have a WhatsApp group where technicians share experience. They also share valuable insight at monthly meetings. The group is very advanced.

#### Could you describe your experience using direct seeding?

I believe direct seeding is a real game changer. I used to work with seedlings, and forest restoration projects cost

twice as much as with direct seeding, not to mention the added logistics concerns. Direct seeding is much more likely to be successful when working with farmers.

#### What benefits are there for farmers from using direct seeding?

Working with seeds has helped farmers to discover the role they can play in forest restoration. And because they already plant corn seeds, for example, switching to tree seeds comes naturally. It is much more straightforward for farmers.

Another attractive option that we recommend to smallholders is planting native seeds alongside short-cycle food crops, like pumpkins and cassava, to pay back their investment in forest restoration. This makes the project economical as well as educational, with farmers acquiring a better understanding of inter-species dynamics. So a single project can combine food production, education about forest management and an opportunity to lessen forest restoration costs.







## Next Steps

The Seed Path's Initiative has helped deliver an enabled condition where two P4F supported Forests Partnerships - Pecsá and Cocoa Agroforestry Restoration - have been able to overcome barriers and blockages to fully realising the potential of the business operations and sustainable land use practices. By helping to remove barriers around the access to proper information regarding direct seeding techniques and supporting the adoption of appropriate landscape regeneration methods that are much more cost effective, it has allowed these businesses to make advances in landscape regeneration more quickly and at lower cost and so deliver on their legal environmental compliance obligations in both the cocoa and cattle supply chains. **This has significant potential for scaling further in these sectors.**

By 2020, the Seed Paths initiative has provided technical assistance for 38 restoration projects and has restored 136 hectares in these pilots. Moving forward, the Initiative will focus on three main objectives:

- **Strengthen remote and in-person technical assistance, combined with continued development in the direct seeding methodologies supported.**

As new learning is captured from practical examples, the Initiative will continue to share lessons with existing and new customers, partners and stakeholders.

- **Structure the supply chain of native tree seeds, effectively connecting supply and demand.** The Initiative will increase the support for collectors and collectors' associations by providing capacity development in areas of management, logistics and other challenges that are presenting bottlenecks in the native seeds value chain.

- **Improve communication, dissemination and production of technical material** to increase reporting and information on direct seeding that is available in the media, supporting decision makers to choose direct seeding for restoration and improve overall public interest in this sector.

The Initiative plans to scale-up the use of the method, increasing the demand and supply of seeds and ultimately the environmental and social impacts that it delivers.



## Updates April 2023

After the project with P4F, the Seed Paths initiative continued and has achieved greater results. By 2023, the number of restoration pilots increased from 38 in 2020 to more than 150 planted areas with a number of technical assistance models. In the 4 years of the initiative, a total of 2,200 hectares have been implemented. The Seed Paths has secured another 350 hectares of restoration with Cargill for implementation in 12 properties during 2023 and 2024. There are other projects in negotiation with the state government of Sao Paulo, Suzano, TikTok among others.

Building on the next steps from the project phase the initiative is aiming at:

- Structuring a network of service providers so they are able to pass on technical assistance and implementation services, ensuring that they do the work with the quality and standard of Seed Paths. The business model can function as a certification and/or franchise, with different formats depending on the territory and size of the required restoration project.

- Based on the experiences of Xingu Seeds Network and Seed Paths, "Redário" – a network of seed networks was created, an organization that brings together technical assistance and commercialization for 22 groups of seed collectors. In 2022 enabled the sale of 16 tons of 170 species.

- In September 2023, there will be the first expedition of the Seed Paths Initiative to take companies, NGOs, researchers, funders and governments to visit restored areas of different periods of implementation and groups of collectors in the state of São Paulo.





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<sup>3</sup> Celentano, D; et. al. Litterfall Dynamics Under Different Tropical Forest Restoration Strategies in Costa Rica. *Biotropica* 43(3): 279–287, 2011. Doi: 10.1111/j.1744-7429.2010.00688.x

<sup>4</sup> Based on data provided by The Seed Paths Initiative





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**Marcio Sztutman**

*Regional Director*

**Felipe Faria**

*Regional Manager*

**Luiz Almeida**

*Monitoring, Evaluation and Learning*

**Isabella Granero**

*Monitoring, Evaluation and Learning*

**Juliana Tinoco**

*External Relations and Knowledge*

**Martin Belcher**

*Monitoring, Evaluation and Learning*

**Stephanie Andrei**

*Monitoring, Evaluation and Learning*

**Text review**

*Maria Rita Villela*

**Design**

*Estúdio da Julia*



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