



seed **madagascar**
sustainable environment, education & development

Annual Progress Report
Year 2024

PROJECT SEKOLY MAINTSO

Carbon Offsetting School Infrastructure



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About Project Sekoly Maintso

In 2005, SEED Madagascar (SEED) launched Programme Sekoly to improve access to education and water, sanitation, and hygiene (WASH) for children in the rural Anosy region of southeastern Madagascar. Over the past 20 years, SEED has addressed this through the construction and repair of more than 30 schools which now benefit over 10,000 students each year. Despite this, the production and transportation of building materials to school sites produces carbon dioxide emissions that contribute to climate change. Climate change disproportionately affects the communities that SEED works with in southeast Madagascar, where there are increasingly unpredictable and adverse weather patterns, including cyclones and droughts.¹ For instance, the period from October to December 2024 was the driest on record, with the rainy season delayed by at least 30 days.² This unprecedented dry spell not only heightened fire risks but also exacerbated food insecurity, putting immense pressure on communities across the entire Anosy region. Intensified climatic risks in southeast Madagascar are expected to place additional pressure on natural resources, accelerating biodiversity loss and threatening the livelihoods of rural communities.

Recognising SEED's responsibility to reduce carbon emissions, protect the environment, and increase community resilience, Project Sekoly Maintso (Malagasy for 'Green Schools') was launched in 2022. Since then, Sekoly Maintso has been planting trees near school sites to offset the carbon emissions of SEED's school constructions and repairs while providing natural resources for communities.

Green Schools

Sekoly Maintso involves planting trees on two sites of community-owned land, one carbon offset site with *Acacia mangium* (Acacia) and one community resource use site with species chosen by the community. All the trees in the resource use site will be available for community use, with 20% available for harvesting five years after planting, and 20% available for harvesting per year after that. To ensure long-term site sustainability and maintenance, the community will replant an equal number of trees after harvesting them from the resource use site.

In each community, a local law, or *dina* in Malagasy, is established or strengthened to ensure the planting sites are appropriately managed. The *dina* is overseen by a committee of community members and sets out conditions for the use of the planting sites. Conditions include imposing fire bans in the planting sites, establishing designated tree harvesting periods, and regulating the number of trees that can be harvested. Community engagement is a key focus of Sekoly Maintso, with students planting fruit trees around school sites and caring for them as well as participating in environmental education sessions to further improve their understanding and involvement in sustainable practices.

To protect the planting sites and the wider community, fire mitigation is a key component of Sekoly Maintso. This involves establishing firebreaks around the planting sites, recruiting and training fire agents, distributing fire mitigation equipment to local communities, and organising community mass mobilisations on fire prevention. As climate change continues to impact southeastern Madagascar with worsening droughts, unseasonably strong winds, and delayed rainy seasons,³ fire mitigation efforts are becoming increasingly crucial to the project.



Carbon Offsetting

Acacia is planted in the carbon offset site because it is a resilient, fast-growing species with scientific research into its carbon sequestration* potential. Acacia is planted before native trees due to their higher survival and growth rates. Once the Acacia are large enough to provide shade, native tree species are planted within the site to create a pocket of forest. Starting from 2025, *Moringa oleifera* (Moringa) will replace Acacia in all future carbon offset sites, offering a better alignment with local practices, such as the cultivation of Moringa for its medicinal and nutritional benefits, alongside offsetting carbon emissions (see section 'Replacing Acacia with Moringa' under 'Key Learnings and Next Steps').

How Does SEED Offset Carbon Emissions?

The carbon emissions of a school construction are calculated using the Inventory of Carbon and Energy (ICE) database for construction materials.⁴ The ICE database is widely used by researchers and professionals as it compiles data from academic literature and has strict selection criteria to ensure consistency.

The database provides the carbon emissions for a quantity of a specific material, such as 1kg of cement or 5kg of oil-based paint. Emissions from building materials, deliveries, classroom furniture, and staff site visits are estimated using the ICE database to estimate the total construction carbon output. Next, the number of trees needed to offset the construction is calculated by dividing the total carbon emissions by the amount of carbon sequestered per tree. Recent findings concluded that the average tropical tree can sequester 50 pounds (22.7kg) of carbon dioxide per year.⁵ As local climatic factors in Anosy would likely reduce the sequestration potential, Sekoly Maintso estimates that the average Acacia tree will sequester 20 kgCO₂ per year over a period of ten years.

Once the Acacia are tall enough, the diameters of a sample are measured at 1.3m above ground level (breast height).⁶ The average diameter at breast height (DBH) across the sample is calculated and entered into an allometric equation** for Acacia. This allometric equation is research-derived and estimates the aboveground biomass of a tree using DBH data. The relationship between aboveground biomass and DBH data is influenced by factors such as climate, land cover, and site management.⁷ Sekoly Maintso takes an average of two allometric equations derived from research in Cote d'Ivoire⁷ and Malaysia⁸ respectively, as there have been no research derived allometric equations developed for Acacia in Madagascar.



* **Carbon sequestration** refers to the process where carbon dioxide is removed from the atmosphere and stored. Trees sequester carbon dioxide in their tissues, bark, and roots through photosynthesis.

** **Allometry** is the study of the relationship between the physical characteristics of an organism, for example, the relationship between the aboveground biomass and the DBH of a tree. An allometric equation is derived from research, and in the case of trees, this often involves cutting down a sample of trees, measuring the aboveground biomass and then plotting these data against the tree's DBH or height. A line of best fit is then plotted on the graph. The equation of this line is the allometric equation as it quantitatively links one physical characteristic with another.

Once the average aboveground biomass has been calculated, the result is multiplied by 0.5 to calculate the average carbon content per tree. This is due to carbon typically accounting for 50% of aboveground biomass.⁹

After the carbon content has been calculated, the result is multiplied by 3.67, the atomic weight ratio of carbon-to-carbon dioxide, in order to calculate the total average weight of carbon sequestered by the Acacia in the sample.⁵ This method is summarised in the equation below. The average carbon sequestered per tree is then multiplied by the total number of trees planted to calculate the total emissions sequestered to date.

$$\text{Carbon sequestered per tree} = [(0.1173 \times (DBH^{2.454})) + e^{(2.081 \ln \ln DBH)}] \times 0.5 \times 0.5 \times 3.67$$

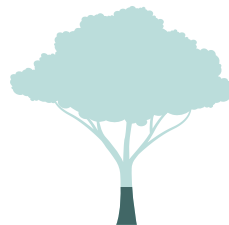
Carbon Offset To Date

Emagnevy



49%
Offset

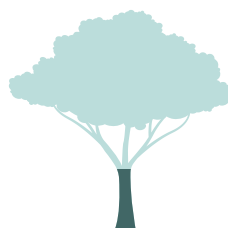
Offsetting: Emagnevy Primary School (EPP), Mananara II EPP, Sainte Luce EPP, Vatambe EPP



12%
Offset

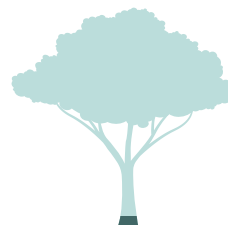
Offsetting: Tsagnoriha EPP

Mandiso



18%
Offset

Offsetting: Mandiso Lower Secondary School (CEG)



1%
Offset

Offsetting: Sarisambo EPP and CEG

Esohihy



1%
Offset

Offsetting: Esohihy EPP

Note: Calculated from DBH data collected in September 2024, the current carbon emissions offset reflects 2.5 years of tree growth for Emagnevy and Mandiso CEG, and 18 months for Sarisambo EPP and CEG and for Esohihy.

‘The seeds we plant today will grow into the forests of tomorrow, laying the foundation for a more sustainable future’

- Haussmann, Project Coordinator



Annual Overview

In 2024, Sekoly Maintso saw another year of expansion. Alongside existing sites in Emagnevy, Esohihy, and Mandiso, SEED established a new planting site in Esinda and identified a new planting site for 2025, Tsagnoriha. This brings the total number of communities involved in the project to five. Setting a new project record, a total of 3,543 trees were planted across the sites to offset four new school constructions, provide resources for three communities to use, and promote environmental stewardship.

In 2024, trees were planted as part of Sekoly Maintso for the first time in Esinda to offset the construction of Esinda EPP and Beandry EPP, which were completed in 2024. Additionally, trees were planted at the existing Emagnevy site to offset the construction of Mahatalaky Upper Secondary School (Lycée), which will be completed in 2025, and at the existing Mandiso site to offset the construction of Beraketa EPP, completed in 2023. Trees for future community use were planted in resource sites in Emagnevy, Esinda, and Mandiso. Native tree species were planted for the first time as part of Sekoly Maintso in 2024, with a trial of 100 seedlings from four different species planted in the carbon offset site in Emagnevy.

In Tsagnoriha, a nursery was created, with a local planting assistant recruited and trained by SEED to manage the nursery and maintain the future planting sites. A *dina* (local law) was established in Esinda to manage the carbon offset and resource use sites by outlining terms of use, such as determining that trees in the resource use site can be rotationally harvested five years after planting. The existing *dina* in Emagnevy was also amended to incorporate the additional trees planted in 2024. Seedlings planted both this year and last year were monitored for survival and growth rates across all sites and replants were carried out as required.

In 2024, community engagement was a focus of Sekoly Maintso, with SEED conducting *dina* leadership training, meetings with key actors, and environmental education sessions. Educational sessions were delivered to students in four communities about the importance of sustainability and tree planting to promote environmental stewardship. Additionally, a community environmental education video, recorded and produced in collaboration with SEED's Renitantely and Masoandro projects,¹⁰ premiered in Mandiso. The video, which showcased the invaluable contributions of community members from Esinda, Emagnevy, and Mandiso, highlighted topics such as biodiversity, ecosystem interaction, and the vital role of the environment in our daily lives.

Following a request from the *dina* committee in Emagnevy, an expanded fire mitigation strategy began in 2024 to protect the planting sites and the wider community. On top of the annual clearance of firebreaks around the planting sites, seven fire agents were recruited and trained to lead community fire responses across all four communities. In Emagnevy, Esinda, and Mandiso, SEED trained *dina* committees on fire management, distributed fire mitigation equipment to community members, and facilitated community mass mobilisations on fire prevention. A total of eight fires were reported by the fire agents across all four communities during the 2024 fire season (July 2024 – January 2025), two of which, were effectively contained by the involved communities using distributed fire mitigation equipment.

This 2024 Annual Progress Report provides an overview of the activities conducted by SEED at each planting site.

IN 2024, SEKOLY MAINTSO PLANTED:

1,317

Carbon offset trees

2,126

Resource use trees

100

Native trees



Emagnevy

Established Site

Established in 2022, Emagnevy is an existing Sekoly Maintso site. In 2022, a total of 1,093 trees were planted to offset the constructions of Emagnevy EPP and Tsagnoriha EPP, as well as the refurbishment of Sainte Luce EPP, and the repair of both Mananara II EPP and Vatambe EPP. Additionally, 325 resource use trees and 144 fruit trees were planted during the same year. In 2024, trees were planted to offset the construction of Mahatalaky Lycée.

Activity Update

- The existing *dina*, established in 2022, was amended to incorporate the additional trees planted to offset the construction of Mahatalaky Lycée.
- Survival, growth, and DBH data were collected regularly, and seedlings were replanted as required by the planting assistant.
- One environmental education session was held by SEED with students to encourage environmental stewardship. The session featured the children's film *The Lorax* as an educational video, followed by discussions related to the film's key themes of the importance of trees and conservation.
- Fire mitigation activities were conducted by clearing the established firebreak around the planting sites, training the *dina* committee on fire management, recruiting and training two fire agents to lead community fire responses, distributing 10 fire beaters and gloves to the community, and organising a community mass mobilisation on fire prevention and alternative agricultural techniques.
- Following discussions around how to maximise community benefits, 1,095 trees were planted in the resource use site to ensure that there were an equal number of carbon offset and resource use trees.
- Four native tree species were planted alongside the existing trees in the carbon offset site, demonstrating an average growth rate of 48% (6.5 cm) and an average survival rate of 88% between April and November 2024.

Emagnevy Plantings in 2024



286

CARBON OFFSET TREES

Planted for offsetting the carbon emissions of school constructions and repairs



1095

RESOURCE USE TREES

Planted for sustainable community use in five years



100

NATIVE TREES

Planted for biodiversity conservation and ecosystem restoration

Carbon Offsetting Calculations



EMAGNEVY EPP

68,229 kgCO₂ 341

TSAGNORIHA EPP

74,403 kgCO₂ 372

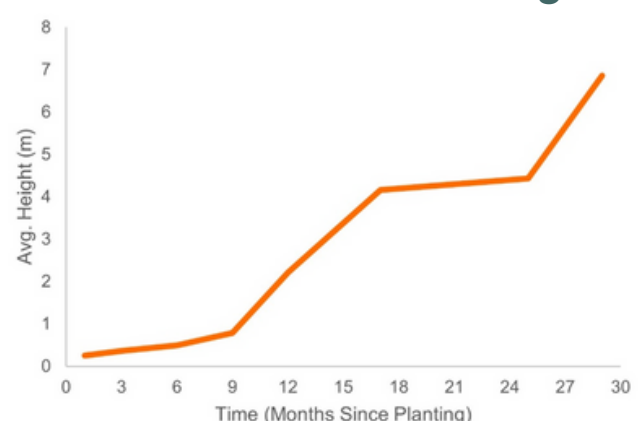
SAINTE LUCE EPP,
MANANARA II EPP,
VATAMBE EPP

75,958 kgCO₂ 380

MAHATALAKY LYCÉE

57,104 kgCO₂ 286

Growth Rate of Seedlings



Esinda

Future Site

Established in 2024, Esinda is a new site for Sekoly Maintso. Trees were planted here to offset the construction of Esinda EPP and Beandry EPP.

Activity Update

- A *dina* and overseeing community committee were established to manage the planting sites.
- Leadership training with the *dina* committee and two meetings with key actors, focused on environmental education and long-term community management of the planting sites, were facilitated by SEED.
- Two signboards displaying *dina* information for the community were constructed and placed outside the planting sites.
- Survival and growth data were collected regularly.
- One environmental education session was held by SEED with students to encourage environmental stewardship. The session featured The Lorax as an educational video, followed by discussions related to the importance of trees and conservation.
- Following a fire that impacted the carbon offset site in July, SEED conducted a training session on agroecology at the community's request, sharing knowledge of sustainable farming techniques that provide an alternative to swidden agriculture and presenting an educational video.
- Fire mitigation activities were conducted by establishing a firebreak around the planting sites, training the *dina* committee on fire management, recruiting and training two fire agents to lead community fire responses, distributing 10 fire beaters and gloves to the community, and organising a community mass mobilisation on fire prevention.

Esinda Plantings in 2024



681

CARBON OFFSET TREES

Planted for offsetting the carbon emissions of school constructions and repairs



681

RESOURCE USE TREES

Planted for sustainable community use in five years

Carbon Offsetting Calculations



ESINDA EPP

67,577 kgCO₂ 🌳 338

BEANDRY EPP

68,552 kgCO₂ 🌳 343



Esohihy

Established Site

Established in 2023, Esohihy is an existing Sekoly Maintso site. In 2023, 340 trees were planted to offset the construction of Esohihy EPP. In addition, a total of 340 resource use trees and 100 fruit trees were planted.

Activity Update

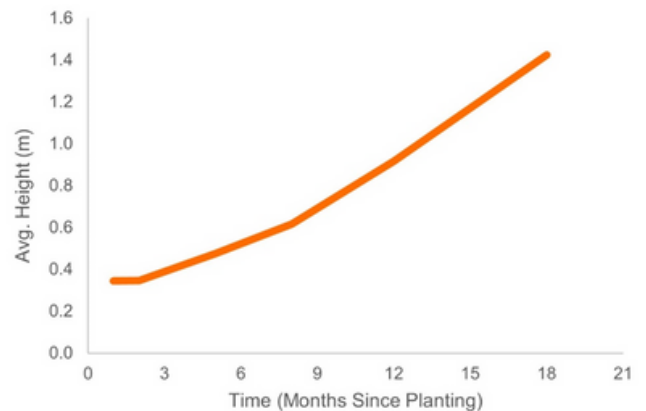
- Survival, growth, and DBH data were collected regularly and seedlings were replanted as required by the planting assistant.
- Two environmental education sessions were held by SEED with students to encourage environmental stewardship. These sessions involved showing educational videos, including The Lorax, and discussions related to the importance of trees and conservation.
- Fire mitigation activities were conducted by clearing the established firebreak around the planting sites and recruiting and training one fire agent, alongside the existing planting assistant, to lead community fire responses.

Carbon Offsetting Calculations



ESOHIHY EPP
64,821 kgCO₂ 🌳 340

Growth Rate of Seedlings



Firebreak clearance around the planting sites



Data collection in the carbon offset site

Mandiso

Established Site

Established in 2022, Mandiso is an existing Sekoly Maintso site. In 2022, 350 trees were planted to offset the construction of Mandiso CEG, with an additional 350 resource use trees and 100 fruit trees planted. In 2023, 680 trees were planted to offset the construction of Sarisambo EPP and CEG, and 690 resource use trees and an additional 100 fruit trees were planted. In 2024, trees were planted to offset the construction of Beraketa EPP.

Activity Update

- One meeting with key actors which focused on the long-term community management of the planting sites was facilitated by SEED.
- Survival, growth, and DBH data were collected regularly, and seedlings were replanted as required by the planting assistant.
- A community environmental education video, produced in collaboration with SEED's Renitantly and Masoandro projects, partly filmed in Mandiso, was presented to more than 100 community members.
- Fire mitigation activities were conducted by establishing a firebreak around the planting sites, training the *dina* committee on fire management, recruiting and training two fire agents to lead community fire responses, distributing 10 fire beaters and gloves to the community, and organising a community mass mobilisation on fire prevention.

Mandiso Plantings in 2024



350

CARBON OFFSET TREES

Planted for offsetting the carbon emissions of school constructions and repairs



350

RESOURCE USE TREES

Planted for sustainable community use in five years



Carbon Offsetting Calculations



MANDISO CEG

62,756 kgCO₂ 314

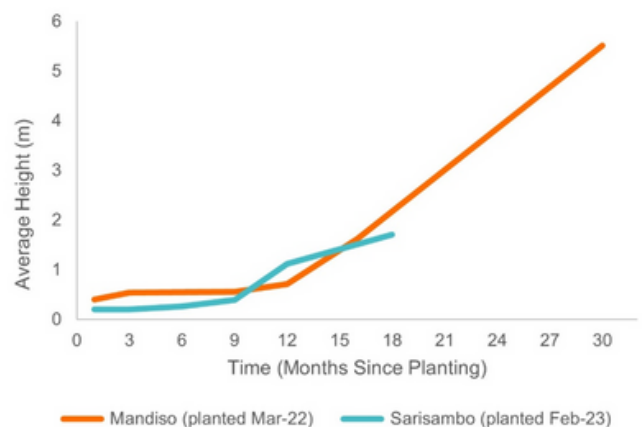
SARISAMBO EPP AND CEG

129,581 kgCO₂ 680

BERAKETA EPP

68,843 kgCO₂ 344

Growth Rate of Seedlings



Tsagnoriha

Future Site

Identified following a needs assessment in 2024, Tsagnoriha will be a new planting site in 2025 where the construction of classroom furniture, developed as part of Project Fanaka, will be offset. Project Fanaka has run as a complement to the Sekoly Programme on an ongoing basis since 2010. Through the provision of student desk-benches to expand classroom seating across schools in Anosy, Madagascar, Project Fanaka aims to create a more conducive learning environment whereby students no longer have to study or write on the floor.

Activity Update

- Meetings were facilitated by SEED with key actors, such as the *Chef Fokontany* (village leader), during which, the locations of the planting sites were decided.
- A local planting assistant was recruited and trained by SEED to manage the nursery and maintain the future planting site.
- A nursery was constructed by the planting assistant in December 2024.

Carbon Offsetting Calculations



FANAKA PHASE 1

28,722 kgCO₂ 🌳 157 Moringa

FANAKA PHASE 2

46,200 kgCO₂ 🌳 252 Moringa

FANAKA MINI-PROJECT

4,454 kgCO₂ 🌳 24 Moringa



Overlooking the new carbon offset and resource use planting sites for 2025



Nursery preparation and seed sowing

Sekoly Maintso To Date

The figures below detail the planting that has occurred since Sekoly Maintso's inception in 2022 and highlight the school construction and repairs that are currently being offset across the planting sites.



3,821

CARBON OFFSET TREES

Planted for offsetting the carbon emissions from the construction of 13 SEED schools



3,831

RESOURCE USE TREES

Planted for sustainable community use five years after planting



444

FRUIT TREES

Planted and cared for by students for community use



100

NATIVE TREES

Planted for biodiversity conservation and ecosystem restoration

Offset Schools

BEANDRY EPP

68,552 kgCO₂

 343

EMAGNEVY EPP

68,229 kgCO₂

 341

ESOHYH EPP

64,821 kgCO₂

 340

BERAKETA EPP

68,843 kgCO₂

 344

ESINDA EPP

67,577 kgCO₂

 338

MAHATALAKY LYCÉE

57,104 kgCO₂

 286

MANDISO CEG

62,756 kgCO₂

 314

SARISAMBO EPP AND CEG

129,581 kgCO₂

 680

SAINTE LUCE EPP, MANANARA II EPP, VATAMBE EPP

75,958 kgCO₂

 380

TSAGNORIHA EPP

74,403 kgCO₂

 372



Community members planting Acacia seedlings

Key Learnings & Next Steps

Replacing Acacia with Moringa

In 2025, Sekoly Maintso will replace Acacia with Moringa to offset the carbon emissions from all future SEED school constructions. While Acacia demonstrates high survival, growth, and carbon sequestration rates, there is increasing evidence that because of its invasive properties, this species can exert negative impacts on biodiversity and water availability.¹¹

Moringa oleifera is a fast-growing, drought-tolerant, and climate resilient “miracle tree”, considered non-invasive in Madagascar.¹² Moringa is already used in local communities for its nutrient-rich leaves, making it more aligned with local practices than Acacia. Including adjustments that account for model errors, around 9% more Moringa trees are required to be planted to meet the same offset requirements as Acacia, which will also provide additional resources for community use.

Agroforestry Pilot

In 2025, Sekoly Maintso will extend its scope by integrating an agroforestry pilot. Set to begin in March 2025 in Tsagnoriha, a 12-month agroforestry pilot will aim to strengthen resilience to child malnutrition and climate change. SEED seeks to achieve this by establishing an agroforestry site, improving agricultural skills and knowledge among project participants, and increasing organisational knowledge of agroforestry challenges and successes. The pilot also seeks to provide supplementary food for schoolchildren, complementing their current diet and contributing to better nutrition.

Agroforestry involves the cultivation of trees and crops on the same land to improve soil health, reduce erosion, enhance water retention, and support climate resilience. The adoption of agroforestry practices has the potential to serve as a model for sustainable land use, as demonstrating successful systems within a community can foster knowledge-sharing and skill development. Thus empowering local stakeholders to adopt practices that balance environmental restoration with productive land use.

Emagnevy

In December 2024, a fire consumed the resource use site in Emagnevy, destroying all 1,420 trees, many of which, were already impacted by a fire that occurred in 2023. The carbon offset site was also impacted, resulting in the loss of approximately 350 trees, 286 of which, were planted to offset the construction of Mahatalaky Lycée. Replanting will begin during the 2025 rainy season, and Moringa will replace Acacia for any carbon offset trees that do not naturally regenerate. In response to a pest infestation of 40 Acacia trees in the carbon offset site, SEED treated every infected tree with a natural pesticide, leading to a 100% recovery of these trees.

Following the successful trial planting of 100 native seedlings in the carbon offset site, an additional 200 seedlings will be planted in 2025. SEED will also conduct environmental education sessions with students and the wider community and continue to monitor the planting sites. The firebreaks will be widened from 5 to 10 metres, and the condition of both firebreaks and distributed fire mitigation equipment will be assessed, with appropriate action taken to maintain their effectiveness.

Esinda

A fire in Esinda in August 2024 led to the loss of 542 seedlings in the carbon offset site. The community was able to extinguish the fire before it reached the resource use site, using distributed fire mitigation equipment. Additionally, the exceptional heat and drought of late 2024 resulted in the loss of 113 seedlings in the resource use site. Taking into account the seedlings that have naturally regenerated, replanting is scheduled for the 2025 rainy season, and Moringa will replace Acacia for the lost carbon offset trees. The construction of Antahovary EPP will be offset in Esinda in 2025, with 377 Moringa trees to be planted in the carbon offset site and an equal number to be planted in the resource use site. Additionally, 100 fruit trees will be planted in and around the school site. A mural with environmental messaging will be painted at the school, incorporating drawings made by schoolchildren during one of the environmental educational sessions. SEED will also conduct environmental education sessions with students and the wider community and continue to monitor the planting sites. The firebreaks will be widened from 5 to 10 metres, and the condition of both firebreaks and distributed fire mitigation equipment will be assessed, with appropriate action taken to maintain their effectiveness.

Esohihy

The exceptional heat and drought of late 2024 resulted in the loss of 110 seedlings planted across the carbon offset and resource use sites. Ongoing monitoring will evaluate the extent of natural regeneration, with replanting to take place as required. The construction of Amboavola EPP will be offset in Esohihy in 2025, with 340 Moringa trees to be planted in the carbon offset site and an equal number to be planted in the resource use site. SEED will also conduct environmental education sessions with students and the wider community and continue to monitor the planting sites. The firebreaks will be widened from 5 to 10 metres, and the condition of both firebreaks and distributed fire mitigation equipment will be assessed, with appropriate action taken to maintain their effectiveness.

Mandiso

In 2025, a total of 100 native seedlings, representing four different species selected based on community preference, will be planted in the carbon offset site. SEED will also conduct environmental education sessions with students and the wider community and continue to monitor the planting sites. The firebreaks will be widened from 5 to 10 metres, and the condition of both firebreaks and distributed fire mitigation equipment, and the condition of both firebreaks and distributed fire mitigation equipment will be assessed with appropriate action taken to maintain their effectiveness.

Tsagnoriha

The construction of classroom furniture by Project Fanaka will be offset in Tsagnoriha in 2025, with 433 Moringa trees to be planted in the carbon offset site and an equal number to be planted in the resource use site. Additionally, 100 fruit trees will be planted in and around the school site. A *dina* and managing committee, who will receive leadership training, will be established to oversee the planting sites, and a signboard displaying *dina* information for the community will be constructed outside the planting sites. SEED will also conduct environmental education sessions with students and the wider community and monitor the planting sites. Fire mitigation activities will be conducted by establishing a firebreak around the planting sites, training the *dina* committee on fire management, recruiting and training two fire agents to lead community fire responses, distributing fire beaters and gloves to the community, and organising a community mass mobilisation on fire prevention.

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About SEED Madagascar

SEED is an award-winning, holistic international development charity that envisages a thriving, healthy, and sustainable Madagascar. SEED's central mission is to work together to build community and environmental resilience in the southeast. SEED achieves this by working across five departments to respond to the most critical needs: community health, education infrastructure, water, sanitation, and hygiene (WASH), rural livelihoods, and environmental conservation.

The approach is based on partnership, co-management, and skill-sharing with individuals, communities, local organisations, and government. The programmes lead to lasting change, alleviation of poverty, and support environmental conservation for some of the world's most vulnerable people in threatened and irreplaceable environments, contributing to the UN's Sustainable Development Goals.

For more information about Project Sekoly Maintso or any of our other programmatic areas, please visit SEED's website or contact us at info@seedmadagascar.org



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