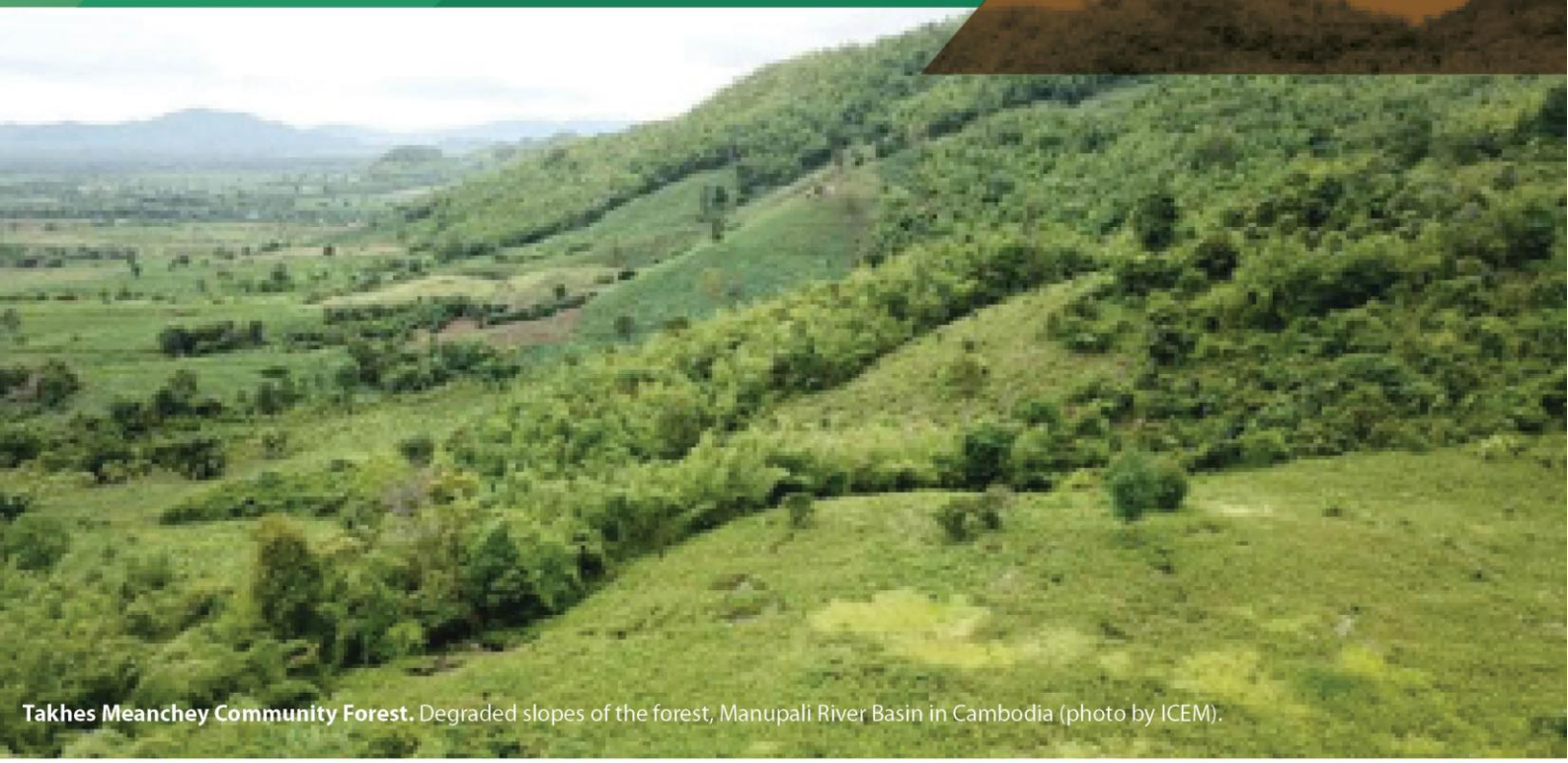
Restoration plans for demonstration areas in Cambodia and the Philippines

(Draft)

Investing in Climate Change Adaptation through Agroecological Landscape Restoration: A Nature-Based Solution for Climate Resilience (Technical Assistance 6539)

March 2024



Takhes Meanchey Community Forest. Degraded slopes of the forest, Manupali River Basin in Cambodia (photo by ICEM).

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Deliverable summaries	TA-6539 Investing in Climate Change Adaptation through Agroecological Landscape Restoration: A Nature-based Solution for Climate Resilience led to the preparation of the following knowledge products: • KP1 (1): Landscape Restoration Country Profile: Philippines • KP1 (2): Landscape Restoration Country Profile: Cambodia • KP3: Business Models to Encourage Private Sector Participation in Sustainable Land and Forest Landscape Management • KP4 (1): Climate Change Risk and Adaptation Options Assessment – Sangker River Basin, Cambodia • KP4 (2): Climate Change Risk and Adaptation Options Assessment – Manupali Watershed, Mindanao River Basin, the Philippines • KP5: Good practices manual on biodiverse forest and landscape restoration • KP6: Community-based Climate Vulnerability Assessment and Adaptation Planning for Resilient Agroecosystems • KP 7: Applying Advanced Technologies in Support of Landscape Restoration and Climate Change Adaptation • KP8 (1): User Manual: Sangker River Basin Decision Support System • KP8 (2): User Manual: Mindanao/Manupali River Basin Decision Support System • KP8 (3): Admin Manual: Sangker River Basin Decision Support System • KP8 (4): Admin Manual: Mindanao/Manupali River Basin Decision Support System • KP9 (1): Restoration plans for demonstration areas in Cambodia and the Philippines • KP9 (2): Gender and Social Inclusion in the Mindanao River Basin, the Philippines, and the Sangker River Basin, Cambodia • KP 10: Integrating the principles of ecological agriculture into upland farming systems of Manupali Watershed, the Philippines
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Photo credit	Cover page: **Takhes Meanchey Community Forest.** Degraded slopes of the forest, Manupali River Basin in Cambodia (photo by ICEM). Back page: **Ecological restoration efforts.** Crops growing in Jamito farm, Philippines (photo by ICRAF).

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Abbreviations

ADB	Asian Development Bank
ANR	Assisted Natural Regeneration
ASEAN	Association of Southeast Asian Nations
A&D	Alienable and Disposal
BAFF	Binahon Agroforestry Farm
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DAO	Department Administrative Order
ICEM	International Centre for Environmental Management
ICRAF	World Agroforestry
DENR	Department of Environment and Natural Resources
GIS	Geographic Information System
GRCA	Genetic resources conservation area
IKS	Indigenous Knowledge System
IUCN	International Union for Conservation of Nature
LFPI	Landcare Foundation of the Philippines, Inc.
LGU	Local Government Unit
MOE	Ministry of Environment
MJP	Maddox Jolie-Pitt
MKRNP	Mt. Kitanglad Range Natural Park
NVS	Natural vegetative strip
NTFPs	Non-timber forest products
PA	Protected Area
PAMB	Protected Area Management Board
PASu	Protected Area Superintendent
PES	Payment for Ecosystems Services
PHP	Philippines Peso
PTCA	Parents-Teachers Community Association
TA	Technical Assistance
TESDA	Technical Education and Skills Development Authority

1 Introduction

The core of the TA is establishing demonstration sites in the Manupali River Basin in the Philippines and the Sangker River Basin in Cambodia. The sites, located in the headwaters of the two basins, are the first steps in the long-term restoration of the broader watershed and also an opportunity to demonstrate restoration techniques to local communities and stakeholders further afield. Over time, the approaches implemented at the sites will be rolled out across the watershed and to other watersheds in Cambodia and the Philippines.

The TA identified four demonstration sites in Cambodia and five in the Philippines. At the sites, the team demonstrated how to plan and implement nature-based solutions to improve landscape resilience and train local communities in practical agroecology techniques and principles at the sites. Over the course of eight missions over two years in both countries, the two national teams have substantially impacted the local communities and landscapes.

In all sites the team mapped and assessed the sites, in the process demonstrating the role and use of new technology and established techniques. Using a range of approaches, including participatory mapping, surveys and consultations, the team established restoration needs and developed restoration plans. In Cambodia, the team supported the local community in planting several thousand seedlings and worked with the community and stakeholders to build and improve the infrastructure (including nurseries and water infrastructure) to maintain and develop the sites over time. At all sites, the team has also provided a series of training courses on the principles and techniques of agroecology and agroforestry. Participants were all local community members and responsible government officials, and over 30% of participants were women.

The Philippines team has worked primarily with working farms in the upper watershed in and on the edges of the Mt. Kitanglad Range Natural Park. The sites are important as the restoration of the landscape close to the park is critical to the local ecology and biodiversity and the integrity and resilience of the wider watershed. By demonstrating techniques that restore and maintain forest, provide for local livelihoods, and improve resilience to flooding, erosion and drought, the sites can serve as a beacon for further intervention across both countries.

This report includes the restoration plans for three of the Cambodia sites, and five sites in the Philippines. One of the original sites in Cambodia, Oslev, was subject to administrative changes and was removed from the project. An alternative site, *Ou Chabpors*, has been identified, but restoration plans have not been developed at the time of writing.

Due to the length and detail of the plans, the main body of the report is an abbreviated summary of the restoration plans. These provide crucial background information and set out the objectives, goals, and core of the plan that has been developed by local communities and farmers. The full plans are provided in the annexes.

Part 1: Summaries of Restoration Plans

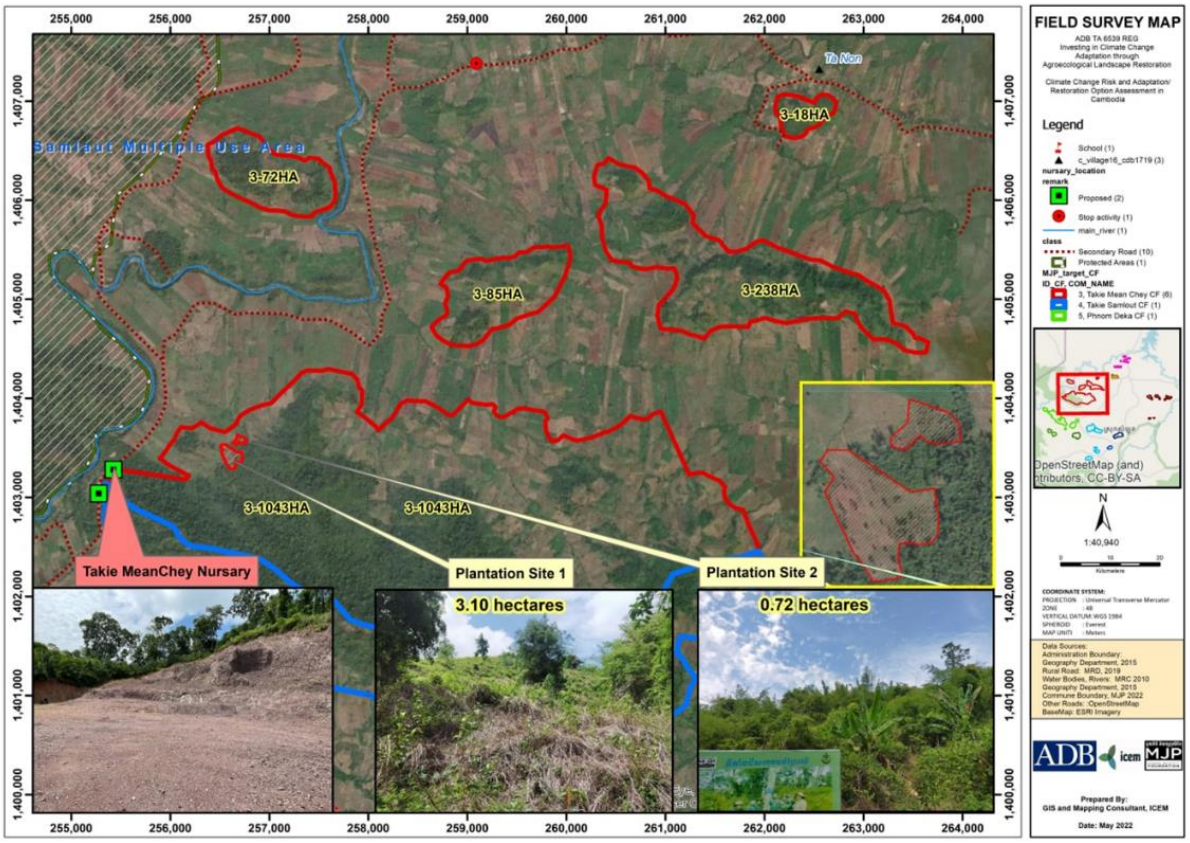
1. Summaries of Cambodia Restoration Plans

1.1. Takhes Meanchey Restoration Plan

Site Description

Takhes Meanchey is located within the Samlaut Multiple Use Protected Area, approximately 13 km northeast of Samlaut town. The site spans 11.6 hectares east of the Sanker River, forming part of a ridge of hills and surrounded by a landscape of agricultural land primarily used for cassava cultivation. The area has been degraded and has some remaining forest on its steeper slopes, some bamboo regrowth, and significant areas of land have been cleared for agriculture.

Figure 1: Takhe Meanchey restoration site location



Source: Geography Department 2015, MJP 2022, OpenStreet Map.

Vision Statement

To reinstate forest and biodiversity linkage between the Takhes Meanchey Community Forest site and the Samlaut Multiple Use Protected Area, enhancing the site's ecosystem services.

Restoration Goal

The plan aims to increase forest canopy cover, restore species composition to its original state, improve ecosystem services such as reducing runoff and soil erosion, reestablish linkages with the Samlaut Protected Area, and enhance carbon sequestration and enhance biodiversity by reforesting areas of cassava cultivation and degraded bamboo grassland and shrubland.

Takhes Meanchey Community Forest has been degraded over time, with the remaining forest confined to higher, steeper slopes


Source: Project Team

Restoration Objectives

Objectives include reestablishing arboreal vegetation cover, enhancing ecosystem services (biodiversity, climate change mitigation, soil, and water conservation), and exploring payment for ecosystem services (PES) opportunities. Specific sites have been identified for restoration, focusing on planting a predominantly native tree species.

Proposed Actions

Actions include starting small, protecting site features, emphasizing native species diversity, understanding and enriching soils, protecting drainage corridors, establishing a water source, and seeking technical assistance (TA).

Field planting site at Takhes Menchey

Source: Project team

The plan sets out key activities for reestablishing forest cover, including establishing a nursery for seedling production, stabilizing drainage lines, replacing cassava cultivation with trees, and exploring

PES opportunities. Nature-based solutions, including leaky dams, brushwood check-dams, and vegetative fencing, are proposed.

Management Plan

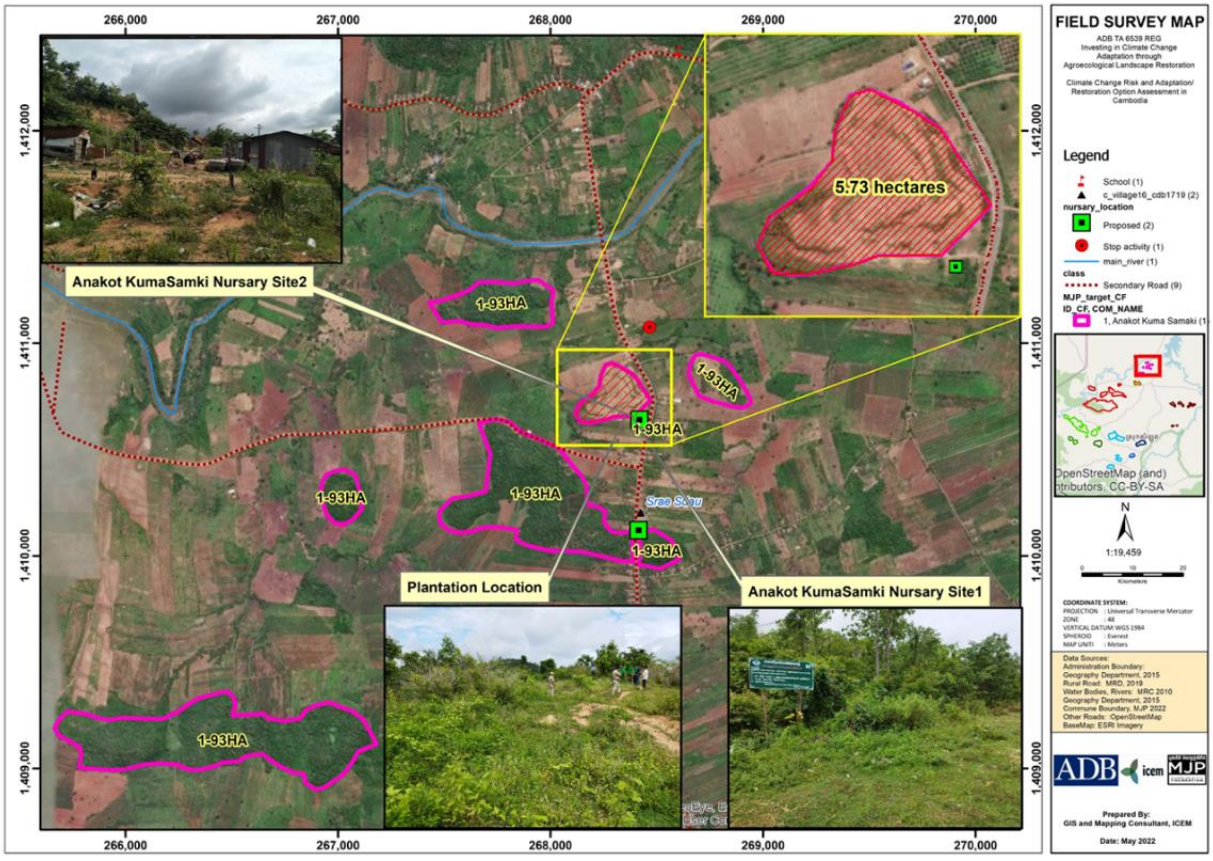
The plan involves measuring ecosystem changes, monitoring and evaluating progress through participatory approaches, learning from experiences to adapt actions, and communicating results and lessons with the local community.

1.2. Anakut Koma Samaki Restoration Plan

Site Description

Anakut Koma Samaki is located approximately 9.6 km from Treng town within the Samlaut District, and encompasses 6.7 hectares. It is a denuded hill previously used for laterite extraction, surrounded by agricultural land and small, wooded hills. The site lacks vegetation, with some areas showing natural regeneration of trees and shrubs, and is primarily used for cattle grazing.

Figure 2: Anakut Koma Samaki Resoration Site Location



Source: Geography Department 2015, MJP 2022, OpenStreetMap

Vision Statement

To transform Anakut Koma Samaki into a demonstration site showcasing successful land rehabilitation, providing environmental, social, and economic benefits to the local community.

Restoration Goal

The goal is to restore the site to its pre-disturbance forest state, acting as a biodiversity conservation stepping stone and demonstration site. The plan aims to utilize created ponds for wetland development, enriching local biodiversity, soil, and water conservation. The area will be developed as a visitor attraction as the site develops, and, over time will generate economic benefits.

The site lacks vegetation, bare rock is visible, and the land is primarily used for rearing cattle


Source: Project team

Proposed Actions

Actions, to be carried out over approximately five years, include identifying suitable native species for restoration, establishing a forest nursery, creating wetland areas, developing community buildings, and promoting the site as a visitor attraction. Principles guiding these actions emphasize starting small, protecting special features at the site, prioritizing native species, protecting drainage corridors, ensuring a consistent water source, and promoting biodiversity within the broader landscape.

Key strategies involve reestablishing natural vegetation, enriching wetland areas, and supporting community involvement in the restoration and development process.

Management Plan

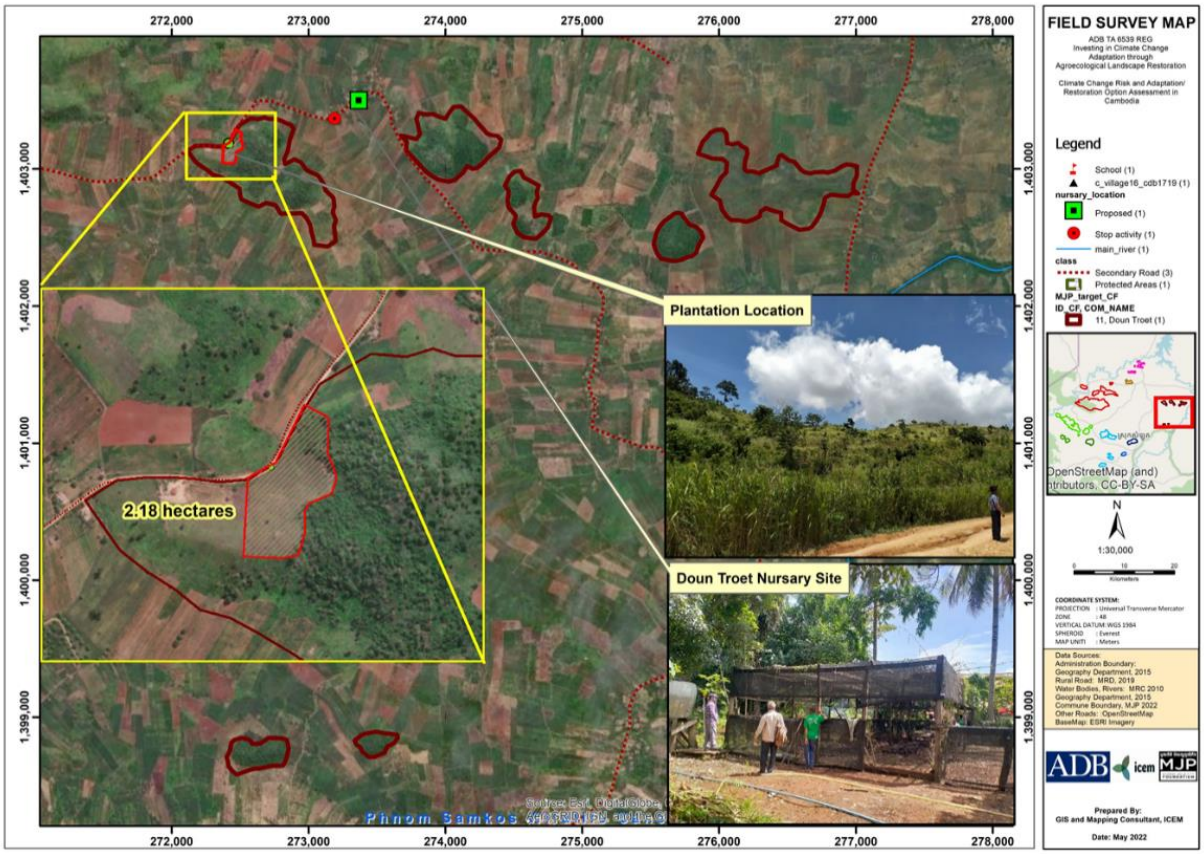
The management plan focuses on measuring ecosystem changes, monitoring and evaluating progress, learning from experiences for adaptive management, and communicating results and lessons with the local community and visitors. It aims to assess the effectiveness of restoration actions and adjust strategies as needed to meet the outlined objectives.

1.3. Dontret Restoration Plan

Site Description

Dontret is a community forest of 44 hectares, located approximately 8.9 km northeast of Samlaut town. Situated near Dontret village, the site consists of a ridge of hills surrounded by agricultural lands primarily used for cassava cultivation. The area has experienced degradation, resulting in a mix of secondary forest, grassland, shrubland, and eroded lands due to agriculture.

Figure 3: Dontret Restoration Site Location



Source: Geography Department 2015, MJP 2022, OpenStreet Map

Vision Statement

To become a multiple-use area that enhances biodiversity, soil, and water resources while also benefiting local livelihoods.

Restoration Goal

The main goal is to reestablish the forest cover within the community forest's boundaries, restoring species composition to match that of undisturbed areas in the region. Efforts will focus on planting native tree species and supporting natural regeneration, with special attention to agroforestry in severely degraded areas to improve biodiversity, timber, and non-timber forest products for local livelihood enhancement. Special priority will be given to nitrogen-fixing leguminous species to improve the soils. An additional goal is to attenuate the negative impacts of rainfall by reducing runoff and soil erosion on steep slopes of the community forest area and surrounding agricultural land.

At the Dontret site, land has been cleared for cultivation and has degraded over time.

Source: Project team

Restoration Objectives

- Strengthen existing forest areas by re-establishing natural vegetation, reintroducing native tree species, and improving biodiversity.
- Introducing agroforestry and conservation agriculture systems to protect soil and water resources and provide diverse products for local livelihoods.

Proposed Actions

The plan is proposed to be implemented over five years.

Initial actions should be small-scale, focused on protecting site features and enhancing biodiversity through a mix of forestry and agroforestry species. Key principles involve understanding and enriching soils, protecting drainage corridors, establishing a consistent water source, and being aware of ecological succession. A significant action is establishing or rehabilitating a community nursery to provide seedlings for the restoration efforts.

Nature-based solutions, including vegetative fencing and check dams, are proposed.

Management Plan

The management plan involves measuring ecosystem changes to assess restoration action effectiveness, monitoring and evaluating progress collaboratively with the local community, learning from experiences for adaptive management, and communicating results and lessons. This approach aims to ensure that the restoration goals and objectives are met effectively and sustainably.

2. Summaries of Philippines Restoration Plans

2.1. Restoration Plan for Mr. Valdueza's Farm in the Buffer Zone of Mt. Kitanglad Range Natural Park

Site Description and Background

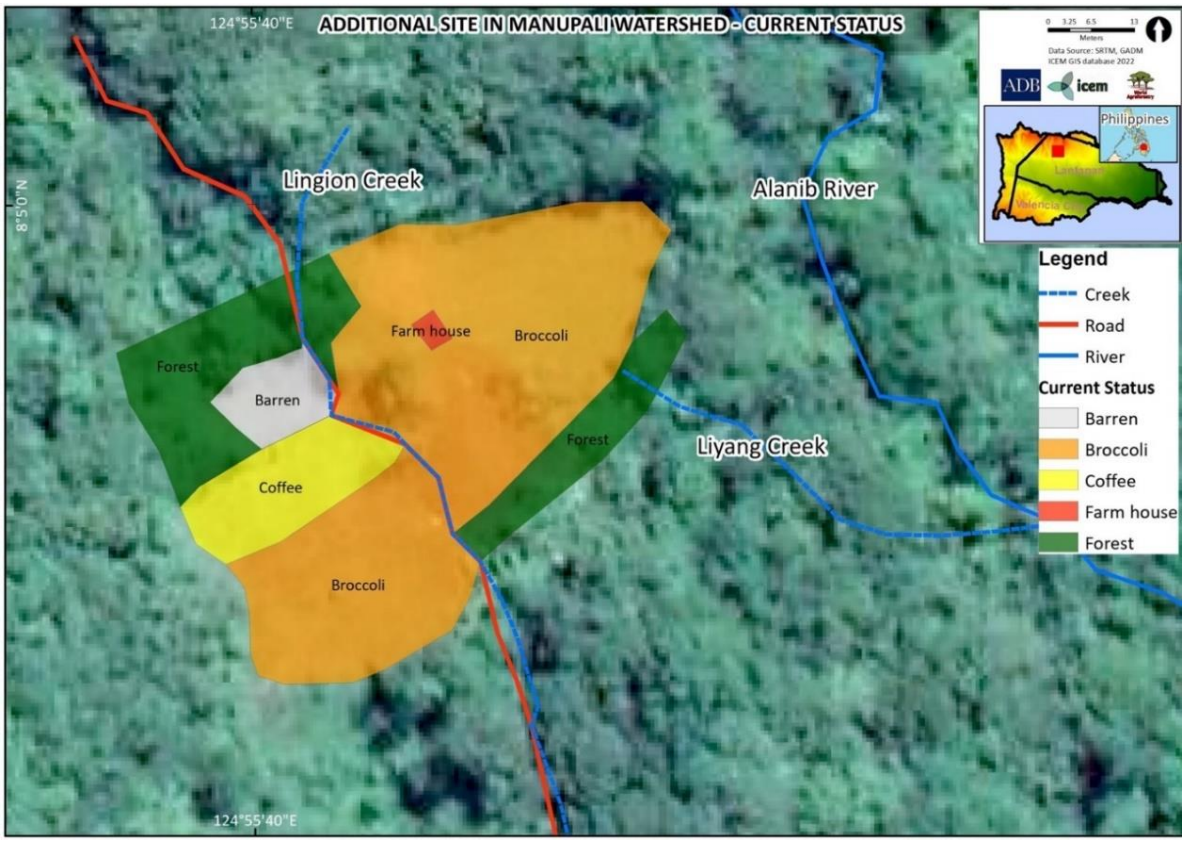
Mr. Valdueza's farm is located within the buffer zone of the Mt. Kitanglad Range Natural Park (MKRNP) in Songco, Lantapan, Bukidnon. The farm is positioned at an elevation of 1,836 meters above sea level. It covers a significant biodiversity area, home to 661 plant species, 58 mammals, including the critically endangered Philippine Eagle, and the world's second-largest flower, Rafflesia schadenbergiana.

The area is managed by the Protected Area Management Board (PAMB), and Mr. Valdueza, a member of the Talaandig tribe, has been cultivating the land long before its designation as a protected area, thus holding a special permit for cultivation.

Current Land Uses

The farm is currently planted with broccoli and coffee. It exhibits moderate steepness, indicating potential erosion risks, and is bisected by Lingion Creek. Natural forests surround the farm, providing an opportunity for biodiversity conservation while achieving economic goals through indigenous upland farming practices integrated with agroecological approaches.

Figure 4: The current land use status of the Valdueza Farm inside the Mt. Kitanglad Range Natural Park as of July 2022



Source: ICEM GIS Database, Project Team

Restoration Goals

To demonstrate ecological integrity restoration and human well-being enhancement, creating climate-resilient ecosystems using local indigenous knowledge and agro-ecological approaches.

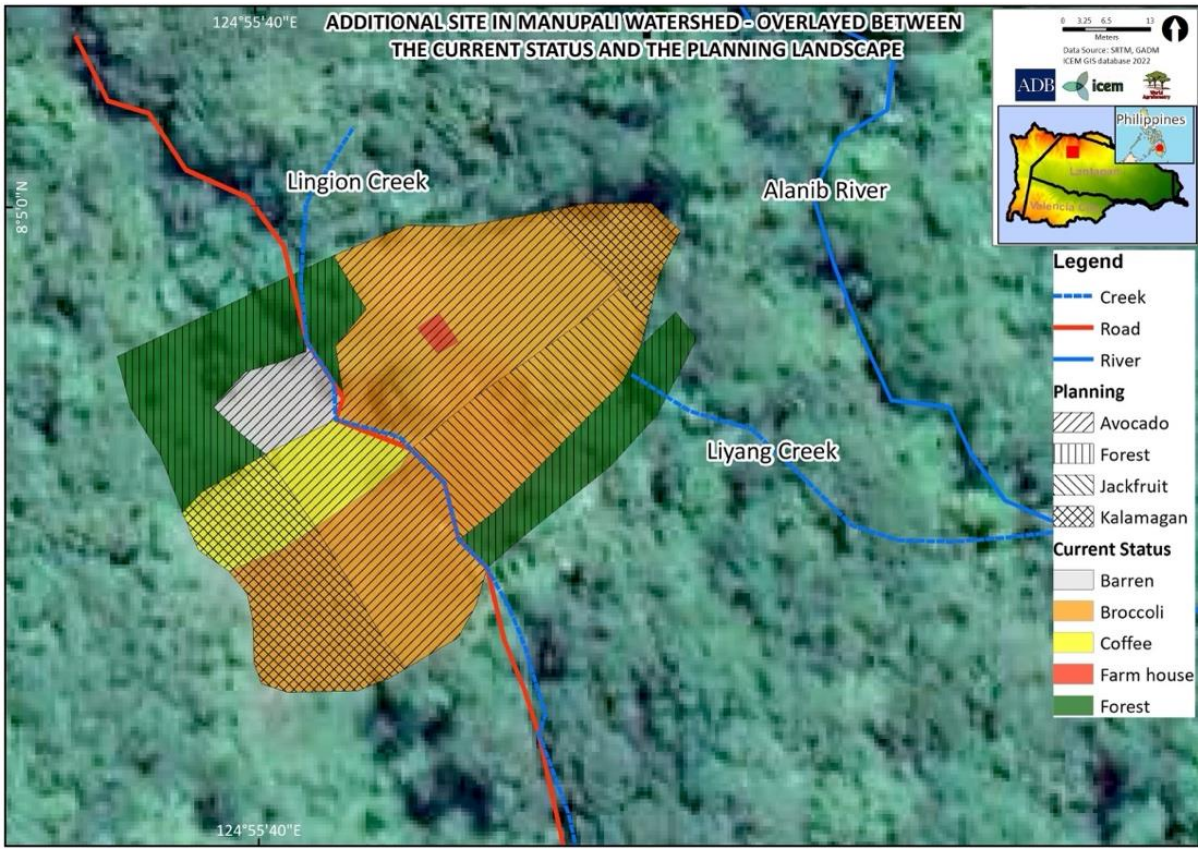
Restoration Objectives

Objectives include protecting remaining natural forests from disturbance, improving hydrological systems, promoting biodiversity conservation, and enhancing livelihood opportunities for the indigenous community through sustainable practices that align with conservation goals.

Proposed Actions and Approach

The plan employs indigenous knowledge systems (IKS) and agro-ecological approaches, including participatory farm planning and the introduction of nature-based solutions. The farm will transition towards an Analog Forestry system, incorporating agroforestry with soil and water conservation measures. Based on Landcare Foundation of the Philippines, Inc.'s (LFPI) plan, the planting stocks will be predominantly obtained from existing nurseries, which are contacts of LFPI. Over the long-term the farm woll develop personal or community nurseries to support the expansion of the restoration works in the watershed. Crop diversification, rotation, and planting native trees, fruit trees, and non-timber forest products (NTFPs) are planned to prevent further degradation, enhance farm income, and protect adjacent natural forests.

Figure 5: The planned land use change as an output of the participatory mapping exercise (July 2022)



Source: ICEM GIS Database 2021, Project team

Monitoring and Evaluation

The Landcare Foundation of the Philippines Inc. (LFPI) and the Village Government will monitor farm status, ecosystem services, and economic outcomes. The monitoring approach includes participatory identification of ecosystem change indicators and robust data collection to demonstrate the economic and ecological benefits of the proposed restoration schemes.

2.2. Restoration Plan for Mr. Yam-oc's Farm in the Buffer Zone of Mt. Kitanglad Range Natural Park

Site Description and Background

Mr. Yam-oc's farm, located within the buffer zone of Mt. Kitanglad Range Natural Park (MKRNP) in Songco, Lantapan, Bukidnon, covers 1.5 hectares. Cultivated by the Yam-oc family for generations, the farm has an elevation of 1748 masl.

The farm is part of MKRNP's diverse ecosystem, housing significant plant and animal species, including the critically endangered Philippine Eagle. Previously cultivated areas are now bare, revealing poor soil conditions and remnants of native forest. The land's current state poses challenges for restoration, requiring efforts to improve soil productivity and protect remaining forest fragments.

MKRNP, a declared ASEAN Heritage Park, is a biodiversity haven governed by the Protected Area Management Board (PAMB) under the DENR. Despite previous illegal cultivation and legal actions by DENR-PASu, an agreement has been reached for the Yam-oc family to undertake rehabilitation efforts.

Mr. Yam-oc is categorized as a below-subsistence farmer. He is heavily reliant on vegetable farming, has little savings, and is highly vulnerable to climate change impacts. Engaging in forest and landscape restoration, with support such as production subsidies and training, is seen as a pathway towards improving his livelihood while contributing to the area's ecological restoration.

Goal of Restoration

To demonstrate ecological integrity restoration and enhance human well-being, creating climate-resilient ecosystems through agro-ecological and indigenous knowledge-based approaches.

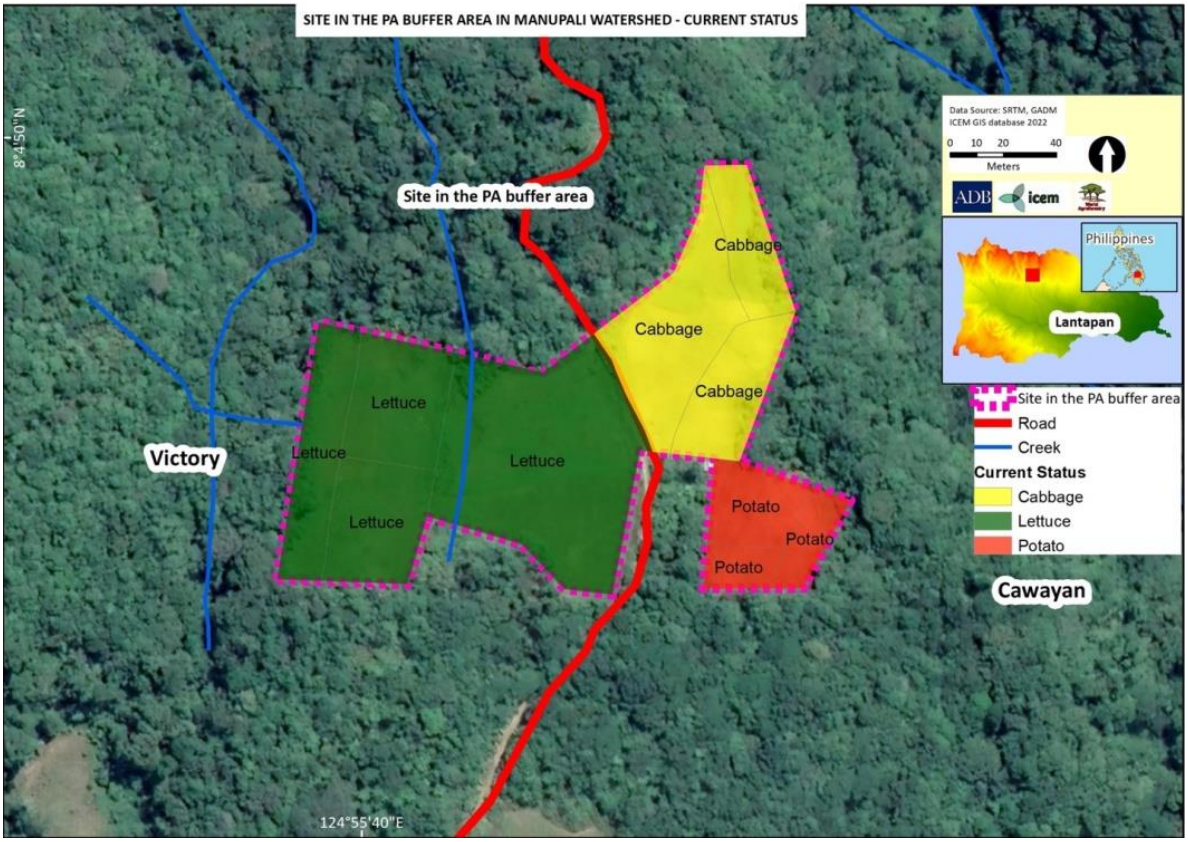
Objectives

The restoration plan seeks to protect the remaining natural forest, improve hydrology, promote biodiversity conservation, and enhance the local forest community's livelihood through sustainable and economically viable practices.

Proposed Actions

The restoration plan includes enriching native vegetation, rehabilitating bare zones, adopting sustainable agricultural systems, integrating non-timber forest products (NTFPs), and creek restoration.

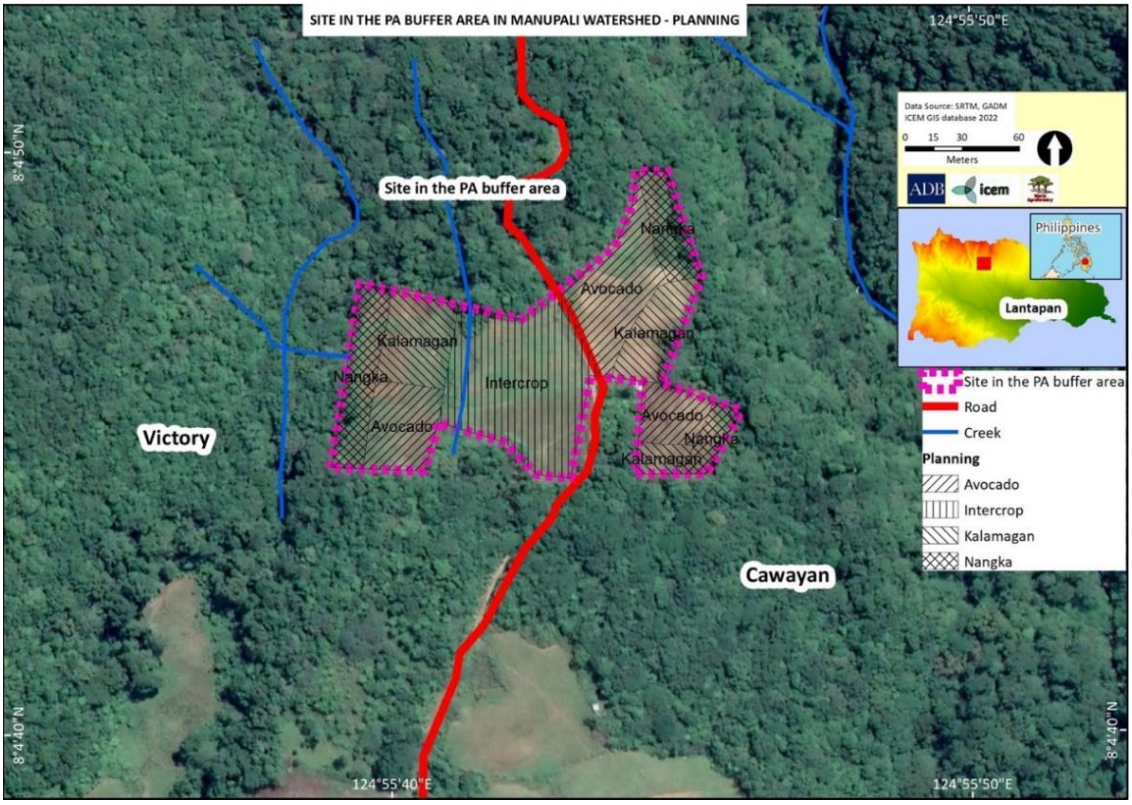
Figure 6: The current land use status of the demonstration site in the Buffer Zone (Yam-oc) in Mt. Kitanglad Range Natural Park based on the participatory mapping exercise last July 2022



Source: ICEM GIS Database 2022, Project team

Initial planning phases involved participatory mapping and site assessments, leading to a refined plan integrating agroforestry systems and analog forestry techniques to protect forest remnants and diversify crop systems for economic and ecological benefits.

Figure 7: The planned land use of the demonstration site in the Buffer Zone in the Mt. Kitanglad Range Natural Park based on the workshop held last July 29, 2022



Source: ICEM GIS Database 2022, Project team

Phasing Approach

The restoration will occur in phases over five or more years to ensure sustainability and address economic needs through cash crops in early years. Gradually, a mixed species approach will be introduced to transition towards a diversified, tree-based cropping system that aligns with conservation goals and enhances the ecosystem.

The Tea Tree (Camellia sinensis) in the Cinchona Forest Reserve where wildlings of several tea species could be collected for use in the demo farms

Source: Project team

Planting Guidance and Spatial Configuration

Detailed planting plans outline species selection for hedgerows and perimeter areas, focusing on native timber trees, fruit trees, abaca, and coffee to create a buffer transitioning from agricultural to tree-based systems. Including economically valuable and climate-resilient species aims to bolster biodiversity, improve soil health, and provide sustainable income sources for the farmer.

Monitoring and Evaluation

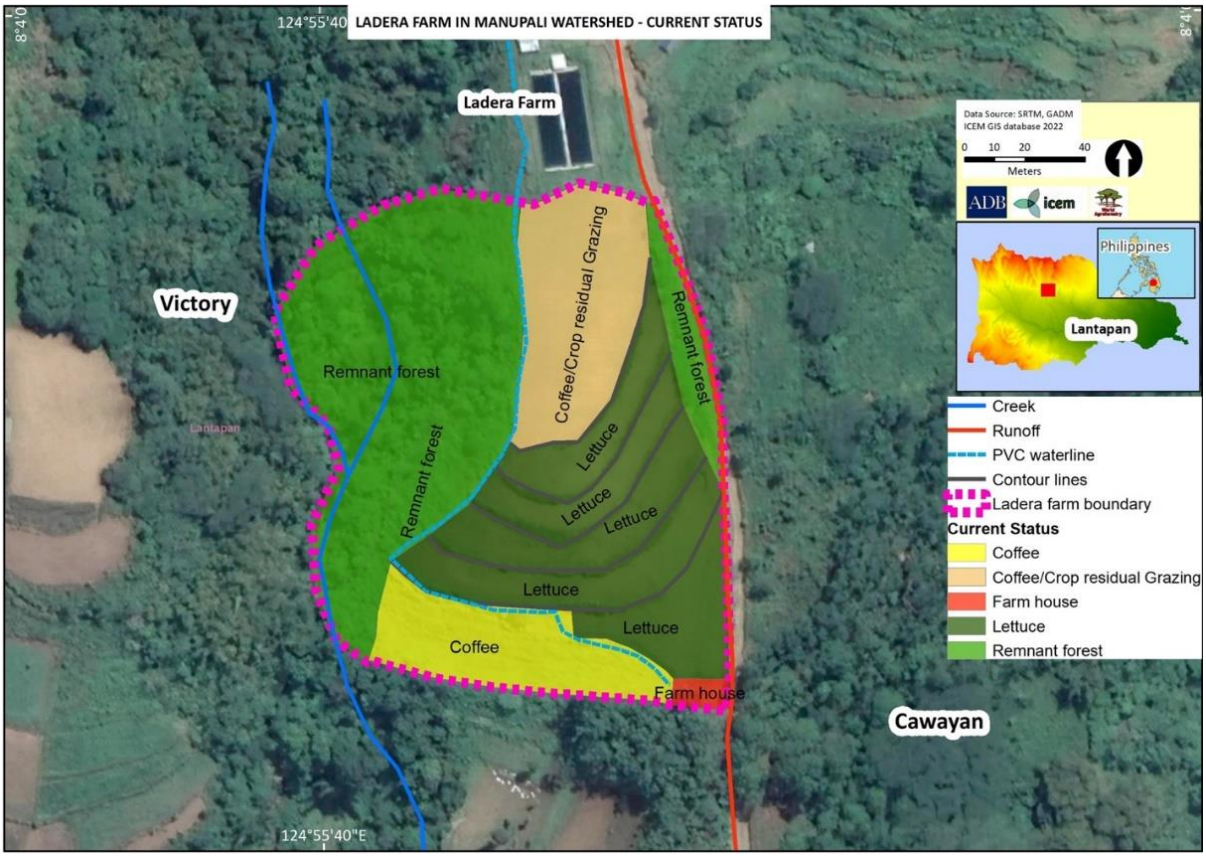
Monitoring will assess the demonstration farm's progress and the effectiveness of restoration actions, involving LFPI and local government. This includes evaluating ecosystem changes, with indicators identified in collaboration with the community, to ensure the restoration's success and adapt practices as needed.

2.3. Restoration Plan for Mr. Ladera's Farm

Site Description and Background

Martino Ladera Jr.'s 1.2-hectare farm is situated in Sitio Bologan, Songco, Lantapan, Bukidnon, near MKRNP, at an elevation of 1,462 meters above sea level. The farm is on an old logging road leading to MKRNP, approximately 0.7 kilometers from the Village Center of Sitio Bologan.

Figure 8: Land use at Ladera Farm (July 2022)



Source: ICEM GIS Database 2022, Project team

The farm currently features hedgerows and vegetable cultivation, with coffee and grazing areas on its upper portion. The western side of the farm, adjacent to remnant forest, showcases steep slopes requiring enhanced soil and water conservation measures, such as terracing and hedgerow enhancement, to prevent soil loss.

Remnant forest adjacent to the Ladera Farm

Source: Project team

Mr. Ladera is relatively resilient to the impacts of climate change impacts due to his multiple livelihood sources. His engagement in forest and landscape restoration aims to transition his sloping vegetable farm towards a conservation farming system incorporating tree-based cropping, driven by incentives such as production subsidies and access to training. This approach is further motivated by the potential for linking his farm to agroforestry and ecotourism opportunities.

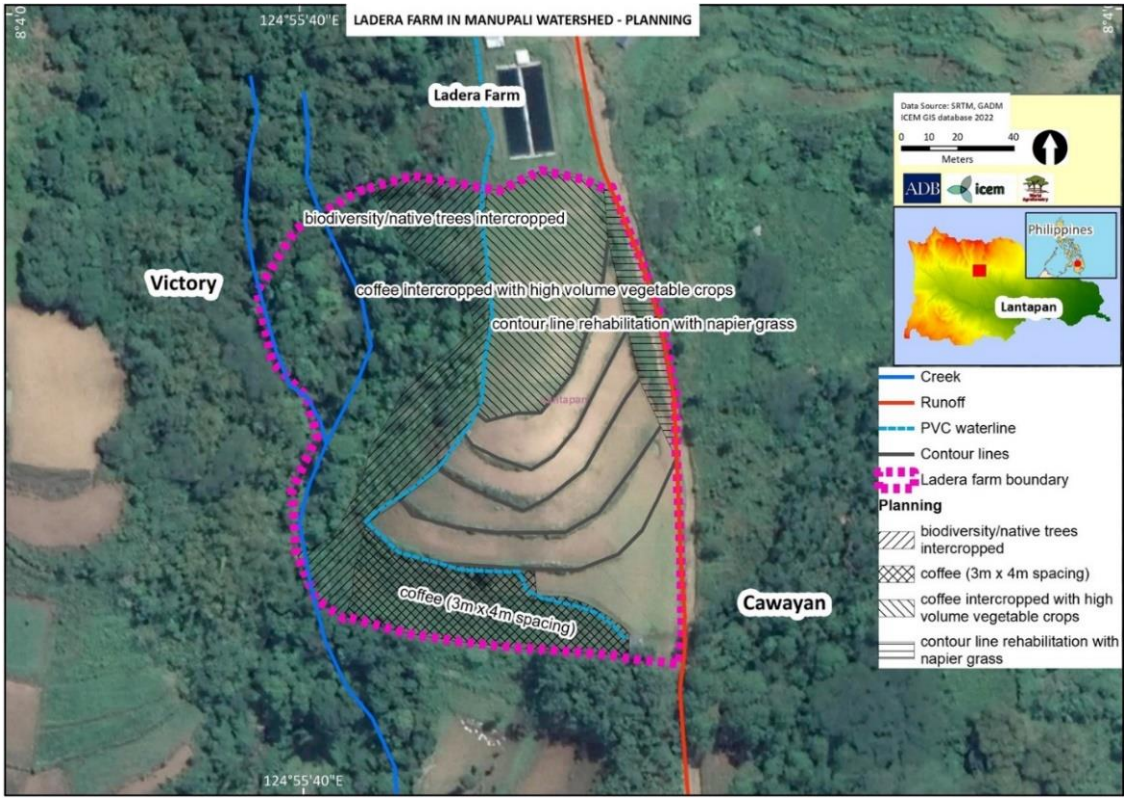
Restoration Goal

To demonstrate ecological restoration and improvements in human well-being and create a climate-resilient ecosystem.

Objectives

The Ladera farm aims to conserve remnant natural forests, protect MKRNP's hydrological system, develop productive lands supporting ecotourism, and enhance the livelihoods of the forest community. The Ladera farm is also an opportunity to showcase to other small-holder tree farmers an economically and ecologically sustainable farming system in the MKRNP.

Figure 9: Planned land use at Ladera Farm



Source: Project team

Proposed Actions

The plan proposes the restoration of native vegetation, implementing soil and water conservation measures, including double hedgerows of natural vegetative strips and fruit trees and crops, introducing economically valuable timber crops, rotating high-value vegetable crops, and transitioning to a complex tree-based agroforestry system.

Benguet pine seedlings planted in the hedgerows with the cash crops/vegetable crops (April 13, 2023)

Source: Project team

Consultations with Mr. Ladera have led to evolving restoration plans that accommodate new ideas and desires for the farm's development, highlighting the importance of engagement with farmers, and maintaining a flexible restoration plan allows farmers opportunities to reflect upon the plan and consult with family and other stakeholders.

Phasing

Over five or more years the plan is phased to prioritize the most important activities, focusing initially on economic objectives through the cultivation of cash crops and gradually introducing mixed-species cropping systems. Later phases will require additional resources, which can be sourced over time.

Table 1: Phasing of activities in the Ladera Farm

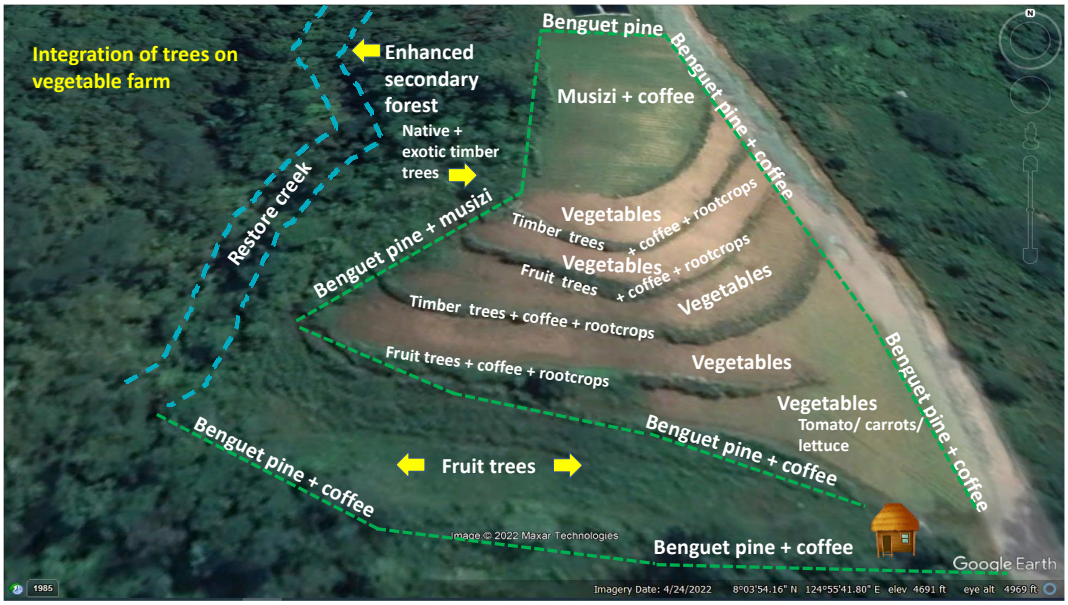
Sources of income	1-3 years	3-5 years	5 years +++
Short-term	Vegetables (tomato/ carrots/ lettuce) → Rootcrops →		
Medium-term		Coffee → Jackfruit → Avocado → Rimas → Kamansi →	
Long-term			Benguet pine → Musizi → Eucalyptus → Aquilaria → Kalingag →

Source: Project team

Planting Guidance and Spatial Configuration

Spatial configuration plans reflect the participatory planning process, emphasizing complex natural vegetative strips with crops and fruit trees. A diverse array of native and economically valuable species, including Benguet pine, lapnisan, and kalingag, is planned for perimeter and boundary plantings.

Figure 10: Spatial configuration of the farmer and team consultation (October 2022)



Source: Project team

Monitoring and Evaluation

Monitoring aims to evaluate the demonstration farm's progress and assess the effectiveness of restoration actions beyond the project's duration. The monitoring plan will be implemented by LFPI and village government, focusing on collaboration, the financial and economic status of the farm, livelihood improvements, and ecosystem services.

2.4. Restoration Plan for the Jamito 1 Demo Farm

Site description and background

The 17.5-hectare Jamito 1 Demonstration Farm is located in Sitio Mapawa, Songco, Lantapan, Bukidnon, an upland village that overlaps MKRNP. A section of the land has been donated to establish a school for local children.

The Jamito Family has donated a portion of their property for a tribal school. The school opens opportunities for children and parents for better environmental education.

Source: Project team

The farm's location within the biodiversity-rich area of MKRNP presents a unique opportunity for combining education with environmental stewardship.

Current land uses

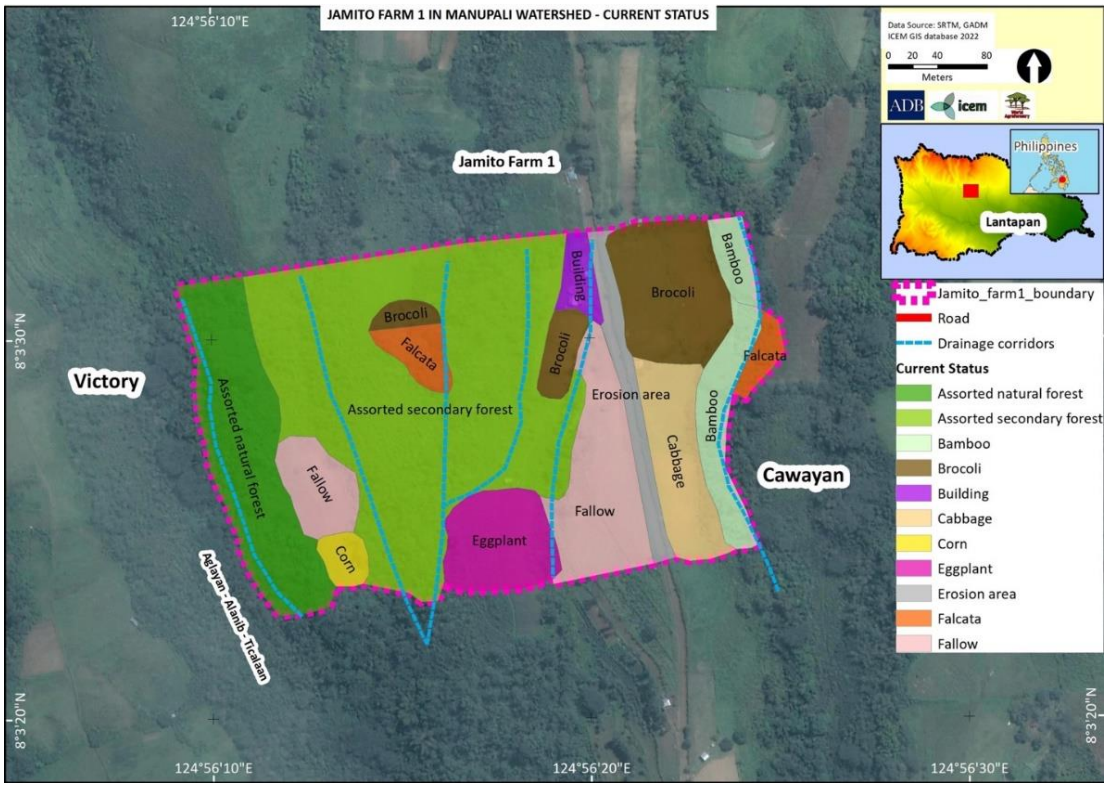
The farm currently supports a mix of agricultural crop production, including broccoli, cabbage, and eggplant, alongside fallow grasslands, bamboo groves, and secondary forests.

The remaining secondary forest in the Jamito 1 property. Below the steep slope is the Alanib River

Source: Project team

There are remnants of a previous government reforestation program, notably poorly performing Gmelina trees, indicating issues with species-site matching.

Figure 11: Current land use of the Jamito 1 Farm



Source: ICEM GIS Database 2022, Project team

Restoration goals

To establish an agroforestry system that addresses food security, productivity, income generation, and environmental management skills for the school community and restore ecological integrity by creating a climate-resilient ecosystem through a partnership between private landownership and the tribal community.

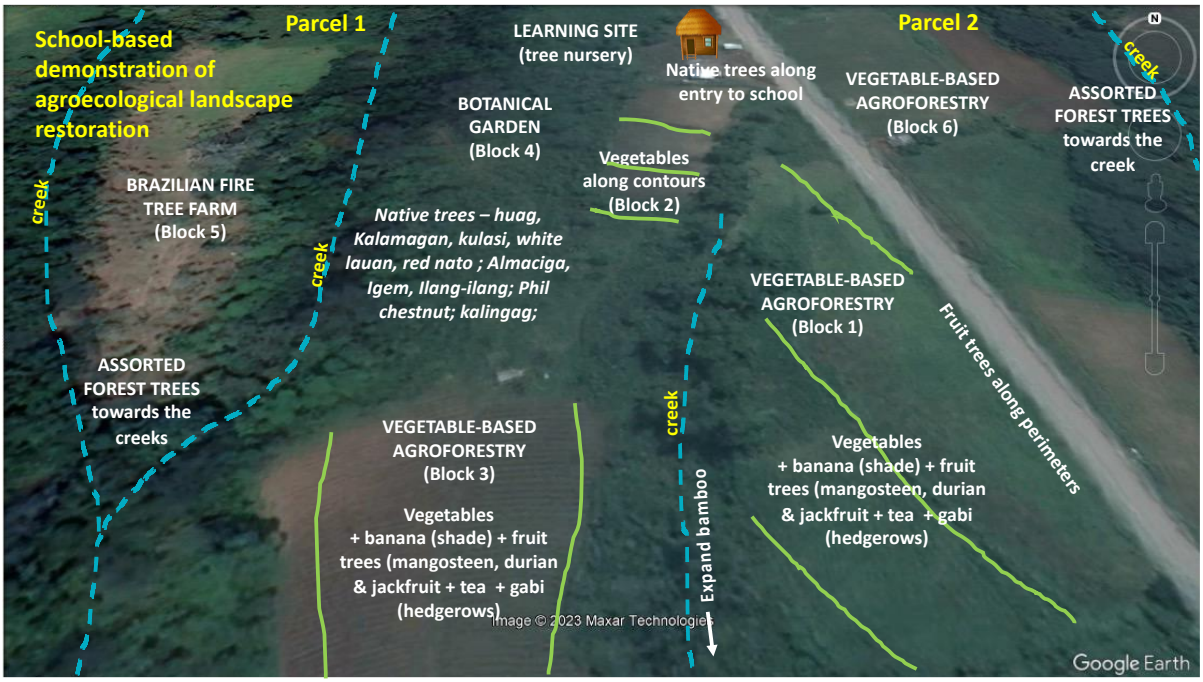
Restoration objectives

Develop a climate-resilient farm model to enhance productivity and ecological integrity, support the school community with farming models for increased productivity and income, and empower them with agroforestry, soil and water conservation, and environmental management skills.

Proposed actions and approach

Actions involve planting food crops identified by the community, incorporating economically valuable crops, and building the community's capacity in agroforestry and environmental management. The restoration plan is participatory, evolving through iterative planning sessions with the community. Key features include soil and water conservation measures, crop planting diversity, and livestock integration for income diversification.

Figure 12: Proposed development interventions in the Jamito 1 Demo Farm based on the enhanced participatory mapping exercise (October 2022)



Source: Project team

Phasing

The restoration plan for both Jamito 1 and Jamito 2 farms will be implemented in phases, taking into account the limited resources currently available, and the long term nature of the ultimate objectives,

In the short term the plan focuses on planting short-rotation and high-value crops alongside hedgerows of coffee, cacao, or matlu to introduce diversity and enhance farm income. Livestock will boost income and food supply, aiming to transition from subsistence to surplus farming for improved socio-economic resilience.

In the medium term (1-5 years) perennial fruit tree species (banana, coffee, cacao, abaca, avocado, jackfruit, tea) will be introduced to to establish stable ground cover and provide a reliable food and income source, enhancing climate and market resilience.

Over the long term (5-25 years) the plan envisages a shift towards a more permanent, native tree-based agroforestry system utilizing long-lived species for sustainable farming and ecological restoration.

The plan includes the establishment of an arboretum, natural regeneration, and production of abaca, coffee, tea, citronella, and various other crops and products. A Mountain and River Resort development is also envisioned, incorporating bamboo treatment training, site development, investor linkages, and resource inventory to showcase conservation measures and create livelihood opportunities through diverse manufacturing and skills training programs.

Monitoring and evaluation

LFPI and the Village Government will monitor the site's progress and the effectiveness of restoration actions. Indicators that track changes to the ecosystem within the community will be identified and a robust data collection regime implemented.

2.5. Restoration Plan for Jamito 2 Demo Farm

Site Description and Background

The 1.2-hectare Jamito 2 Farm, is situated in Sitio Cawayan, Songco, Lantapan, Bukidnon, spans 12 hectares, and is located near MKRNP. The farm is highly accessible and visible, only 390 m from the main road. The elevation is approximately 1,123 meters, offering unique agricultural and ecotourism potential.

Current Land Uses

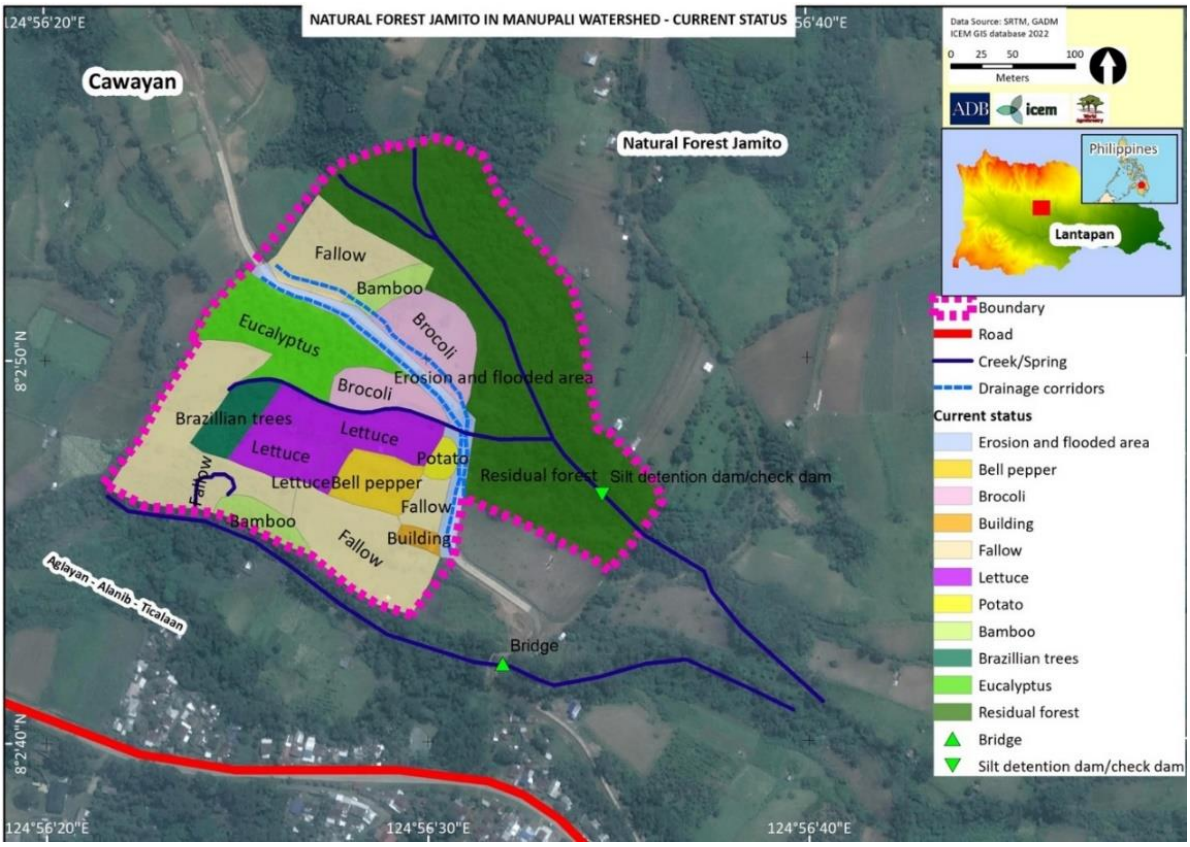
The farm currently hosts vegetable crops (including lettuce, potato, and broccoli), fallow areas, Eucalyptus and Brazilian fire tree plantations, and is bordered by the Alanib River, which boasts bamboo groves.

Portion of the Alanib River with bamboo grove

Source: Project team

A remnant natural forest with a small creek also exists, marking a previous soil erosion monitoring station.

Figure 13: Current land use status of the Jamito 2 Farm



Source: ICEM GIS Database 2021 and Project team

Restoration Goals

To transition the vegetable farm into a demonstration site for agroecological farming and Assisted Natural Regeneration (ANR) in the adjacent forest patch, restoring ecological integrity and enhancing human well-being by creating climate-resilient ecosystems through private landowner partnerships.

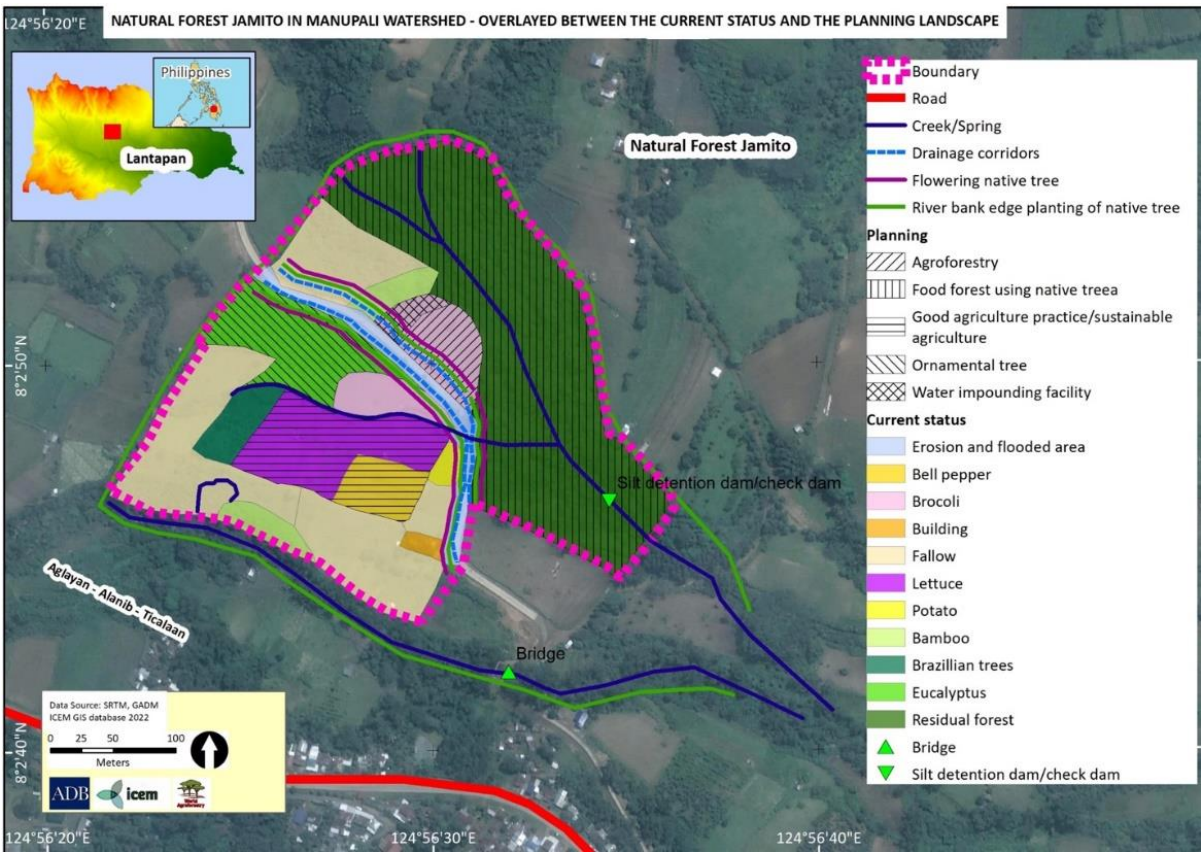
Restoration Objectives

Establish cropping systems that can boost incomes, showcase complex, tree-based agroforestry for income and conservation, demonstrate soil and water conservation practices to protect adjacent drainage systems, and develop a genetic resource conservation area for native trees.

Proposed Actions and Approach

A participatory planning process identified diverse agroforestry schemes, incorporating high-value crops, root crops, fruit trees, and native species to enhance biodiversity and income. Organic farming and crop diversity/rotation are also planned. The approach includes agroforestry alongside ANR, with plans for a genetic resource conservation area within the remnant forest.

Figure 14: The combined current and future/planned land use in the Jamito 2 Demo Farm based on a participatory mapping exercise



Source: ICEM GIS Database 2021, Planning team

Phasing

The size of the farm necessitates a phasing approach as current resources are limited, and it will take time to attract and amass the funds required.

In the short term the plan proposes planting short-rotation and high-value vegetable crops alongside hedgerows of coffee, cacao, or matlu. Introducing livestock will diversify income sources, helping farmers to transition from subsistence to surplus production.

Over the medium term (1-5 years), perennial fruit tree species will provide a stable ground cover and reliable income, enhancing resilience to climate change and market variability.

Over the long (5-25 years) a shift towards a more sustainable agroforestry system incorporating native, long-lived species will help the farmers transition away from subsistence farming.

The strategy will require the development of:

- Arboretums, assisted natural regeneration areas, and abaca, coffee, tea, and citronella production facilities.
- A seedling nursery and tissue culture laboratory to support agricultural diversity.
- Livestock production, high-value crop processing, and bamboo production to increase farmer income and biodiversity.
- A Mountain and River Resort, integrating bamboo structure training, site development, and ecotourism to enhance the site's educational and recreational value.

Key activities encompass soil and water conservation, biodiversity preservation, and livelihood enhancement through diverse agricultural practices. The plan promotes organic farming, crop rotation, and the introduction of a genetic resource conservation area for native species.

Monitoring and Evaluation

The Landcare Foundation of the Philippines Inc. and the Village Government will monitor the farm's progress and the effectiveness of restoration actions. The monitoring plan will track changes to the farm and surrounding ecosystem. Indicators will be identified collaboratively with villagers to ensure meaningful, measurable outcomes.

Cambodia Restoration Plans

Takhes Meanchey. Cambodia (photo by ICEM).

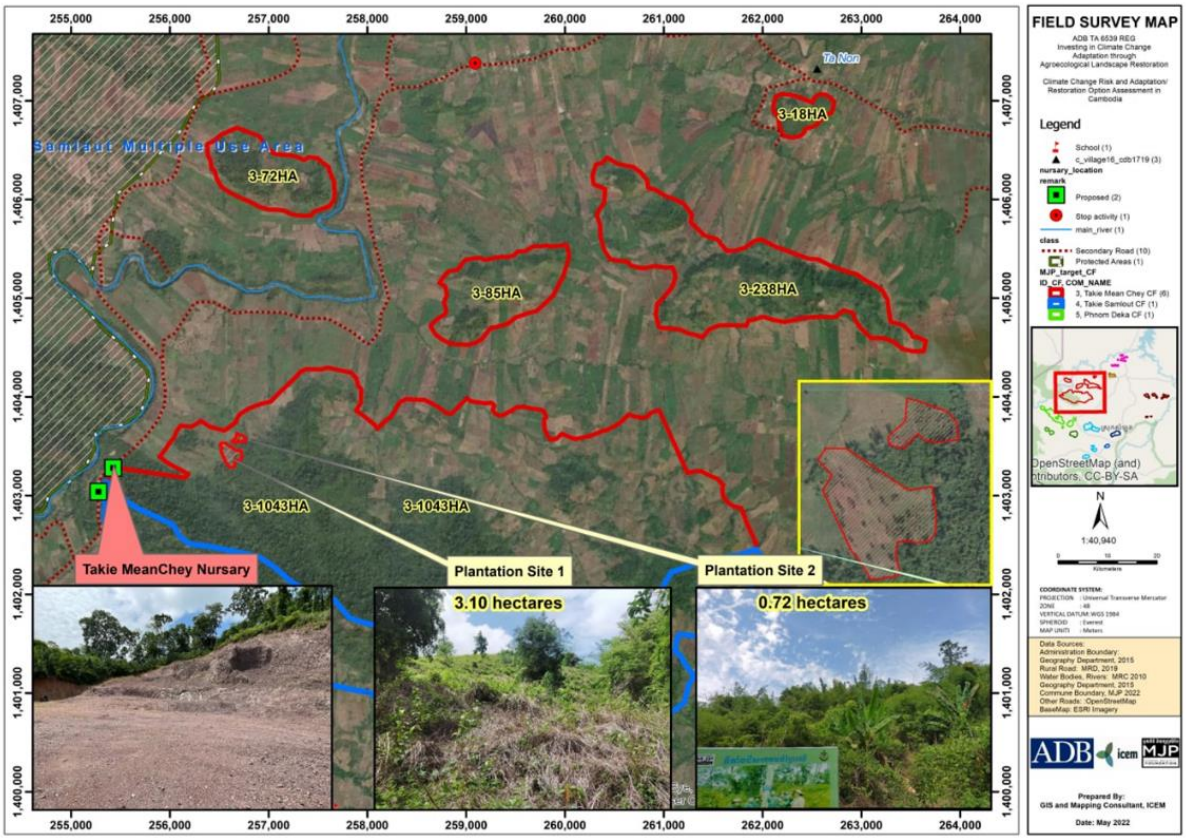
From the People of Japan

3.1. Takhes Meanchey Restoration Plan Outline

3.1.1 Site Name and Location: Takhes Meanchey

The area is in Mean Chey khum (commune), Samlaut District, some 13 km NE of Samlaut town at 12.685501 N 102.759223 E as shown in Figure 15. The community forest area is about one kilometer east of the Sanker River, within the Samlaut Multiple Use PA boundary. It covers an area of 11.6 ha.

Figure 15: Takhe Meanchey restoration site location



Source: Geography Department 2015, MJP 2022, OpenStreet Map.

3.1.2 The Vision Statement

To reinstate the forest and biodiversity linkage between Takhes Meanchey Community Forest site and the Samlaut Multiple Use Protected Area and to improve the site's ecosystem services.

3.1.3 Site Description

The site forms part of a ridge of hills running east-northeast west-southwest for about five kilometers east of the Sanker river, which forms the boundary of the Samlaut Multiple Use Protected Area. The ridge has been encroached by cultivation along its length, and the remaining forest cover now varies in width between 450 m and 1.7 km. The hills sit in a flat, gently undulating landscape of agricultural land dominated by cassava cultivation, interspersed with some fruit tree plantations of mango, cashew, and longan.

The site forms part of the Takhes Meanchey Community Forest but has been encroached upon and degraded over time, with the remaining forest largely confined to the steeper slopes of the central ridge. The site for rehabilitation is only part of the greater Community Forest. It consists of forest, bamboo regrowth, land cleared for cassava cultivation, and land currently under cassava that is rotated with maize.

Takhes Meanchey Community Forest has been degraded over time, with the remaining forest confined to higher, steeper slopes.


Source: Project Team

The current situation mapping (Figure 16) shows that forest is still the main land cover, but it contains areas of bamboo regrowth and a central area that was originally cleared for cassava cultivation, and is now grassland and shrubs. The only cassava cultivation within the area that is earmarked for rehabilitation is situated close to a drainage line at the northeastern boundary. However, there is extensive cassava cultivation to the north and east.

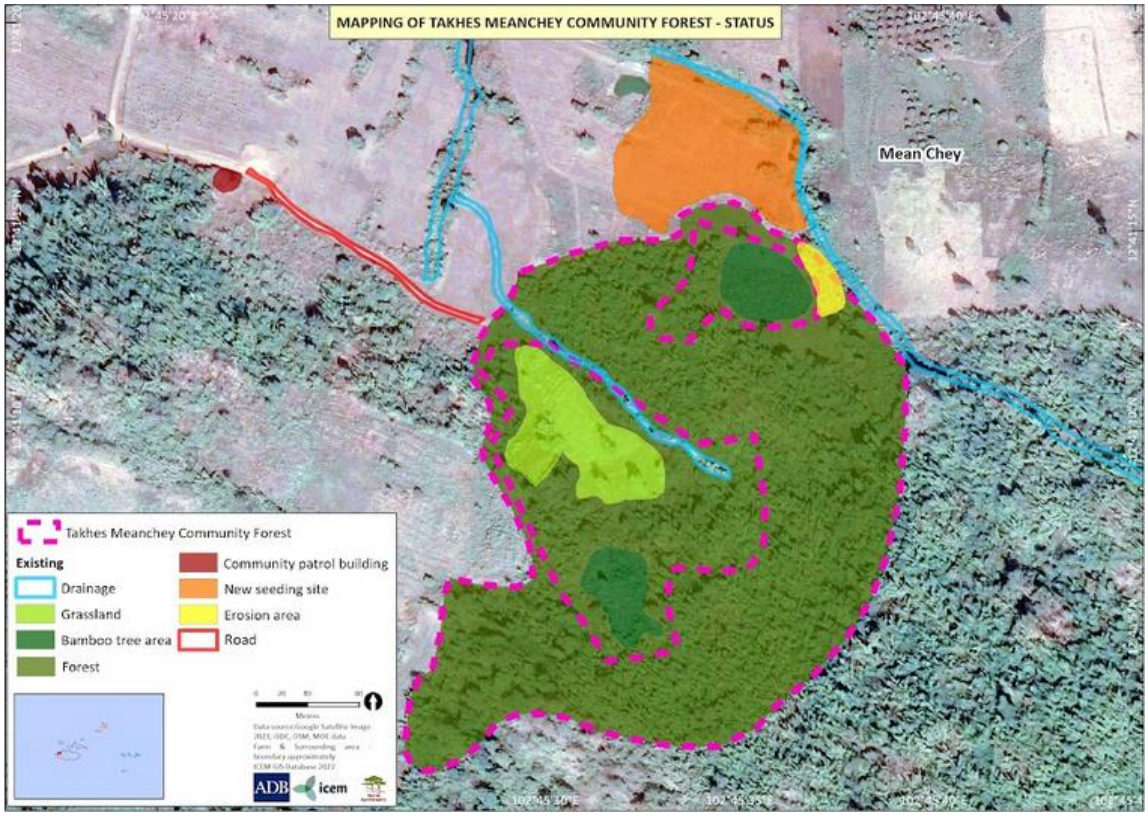
Two drainage lines run through the site to the north at the western and eastern boundaries. Flooding is not reported to be an issue in the area.

The closeness to the Samlaut Multiple Use Protected Area, forest cover, and existence of rivulets that maintain at least some water most of the year are factors that have resulted in visits of different species of fauna from the protected area, such as deer, wild boar and a large variety of birds.

Areas of soil erosion have been identified and mapped and are associated with forest clearance for cassava cultivation. In contrast to cassava cultivation at Dontret, cassava is grown in rows along the contour, which helps reduce runoff and soil erosion. This was observed in the field survey, where there was little evidence of severe soil erosion, no rills, gullies, or downslope sedimentation, and the soil contained some organic matter that may, however, only be evidence of recent deforestation and conversion to cultivated land.

The area below the community forest is flatter and dominated by agriculture. In the area, investors from Thailand have bought land and dug several dams that serve as water reservoirs for their investments in agriculture, fruit trees, and high-value tree plantations, including teak (*Tectona grandis* and rosewood (*Dalbergia latifolia*).

Figure 16: Takhes Meanchey Status



Source: Google Satellite image, MOE Data, ICEM GIS Database 2022

3.1.4 Goal of Restoration

The present plan is based on the results of the participatory methodology applied during the project mission in July 2022. The local population must make decisions on land use, and this document is only intended to support that process. **The goal of restoring the Takhes Meanchey Community Forest site is to increase the forest canopy cover and to restore the species composition to one similar to its original state**. This will reinstate the linkage between the site and the Samlout PA to the west and reestablish the forest's ecosystem services for the downstream agricultural land and forest plantations through a reduction in runoff and soil erosion, as well as ensuring a more stable water resource in the two rivulets running from the site.

The forest restoration in the community forest will replace the cassava cultivation inside the area's limits and much of the degraded bamboo grassland and shrubland. This will improve carbon sequestration and thereby mitigate climate change (global environmental benefit), work as a local adaptation to climate change, as well as enhance biodiversity in the area with the potential of developing eco-tourism, e.g., Takes Meanchey as a port of entrance to the protected area.

Another goal that would have to be negotiated is the possible PES from the Thai investor based on the protection of the land downstream of the community forest.

Rivulets provide a stable water source (left); forest regenerating at the site (right)

Source: Project team

3.1.5 Objectives

Figure 17 shows the proposed restoration sites chosen by the community during field discussions and participatory mapping in July 2022. Two sites have been identified, one in the west and one in the east, and both have been subdivided into three areas corresponding to specific trees to be planted.

Main objectives for the site development:

- Reestablish the arboreal vegetation cover, which will link to the Samlaut Multiple Use Protected Area.
- Provide improved ecosystem services, including biodiversity, climate change mitigation and adaptation, and soil and water conservation, that will benefit the local population and the agricultural land and forestry plantations downstream from the community forest area.
- Explore opportunities for PES.

The site plans developed for the two areas are the following:

West Area

This area is degraded forest cleared for cultivation but is currently under grassland and shrubland. This restoration aims to reestablish the forest cover with a mix of native and exotic trees in the grassland/shrubland. From west to east, the areas identified are proposed to be planted with *Acacia* spp (Mimosaceae) 0.17 ha, Kapok (*Ceiba pentandra*) 0.34 ha, Koki (Dipterocarpaceae) 0.3 ha.

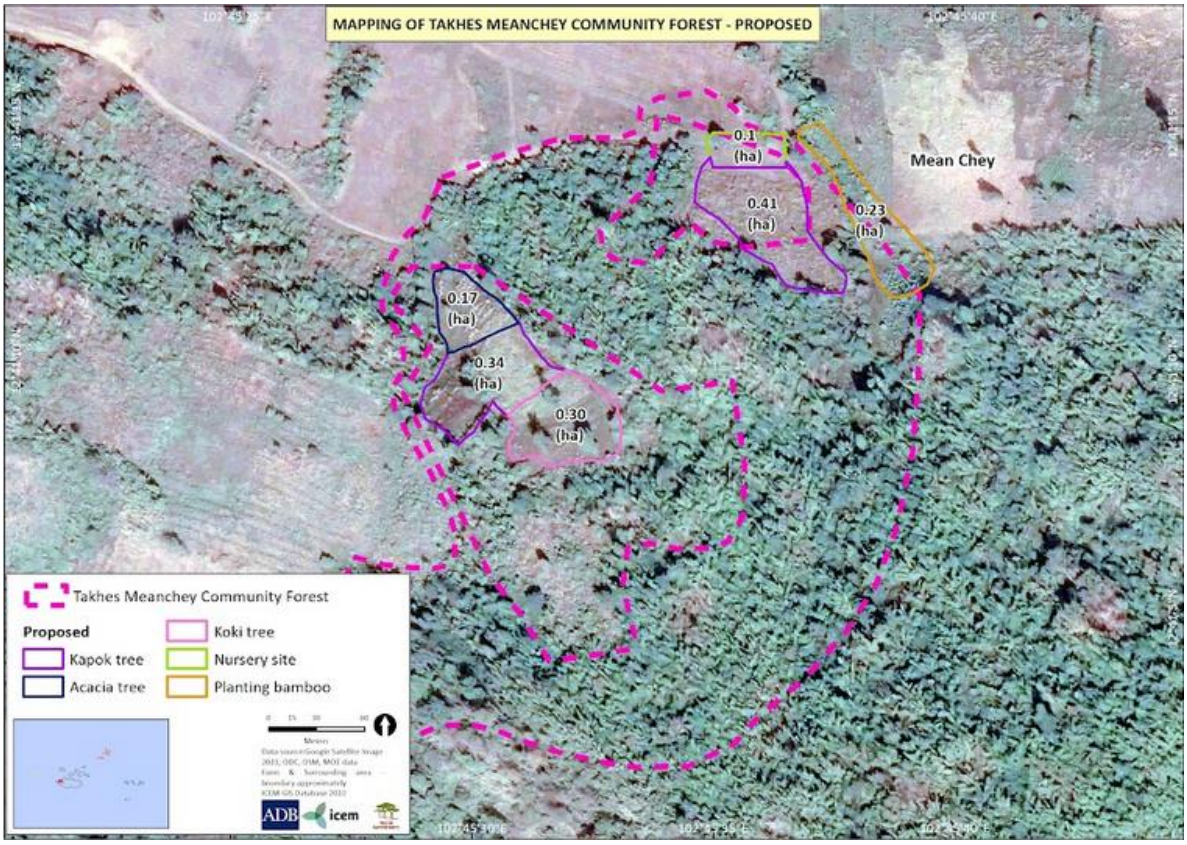
East Area

This area is a degraded forest, originally cleared for cultivation, but now has bamboo regrowth to the west of a drainage line. The participatory planning exercise defined the objectives of this restoration as to reestablish the forest cover with kapok (*Ceiba pentandra*) in the bamboo regrowth area (0.41 ha), to plant bamboo to stabilize the drainage line (0.23 ha) and to create a community nursery (0.1 ha). The project team, however, recommends not planting kapok and bamboo since these species are

highly invasive. Instead, they should plant forest trees near the rivulets, preferably native species with low water consumption. This would simultaneously improve the biodiversity, both flora and fauna.

There is also a small area currently under cassava mapped as 'Erosion Area' in Figure 17 between the bamboo regrowth, where the participatory exercise considered that it should to be planted with kapok and the drainage line to be planted with bamboo. The project team is proposing that this area be planted with less invasive native and exotic species such as native *Shorea* spp (natives) or Teak *Tectona grandis* (exotic, but native to SE Asia). See also list of some native species in Annex 1. If cultivated, the land user should ensure that conservation agriculture is practiced with minimum soil disturbance and planting along the contour.

Figure 17: Takhes Meanchey Restoration Sites



Source: Google satellite image, MOE data, ICEM GIS Database 2022

3.1.6 Actions

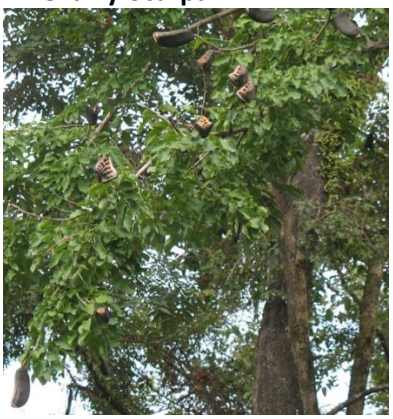
The actions required to meet each objective are outlined below.

Guiding principles for the actions are:

- Start small
- Protect the special features of the site
- Plant for diversity with increased use of native tree species
- Understand the soils – protect and enrich as needed
- Protect drainage corridors
- Establish a consistent water source
- Be aware of ecological succession to allow a diverse system to evolve
- Promote biodiversity linkages within the larger landscape
- Assure financing in advance of any activity and explore opportunities for sustainable financing such as PES.
- Use the project field manual as a guide, but with flexibility based on local conditions
- Seek technical assistance whenever possible

Water pond (left) and commercial plantation (right) developed by Thai investor.

Source: Project team.

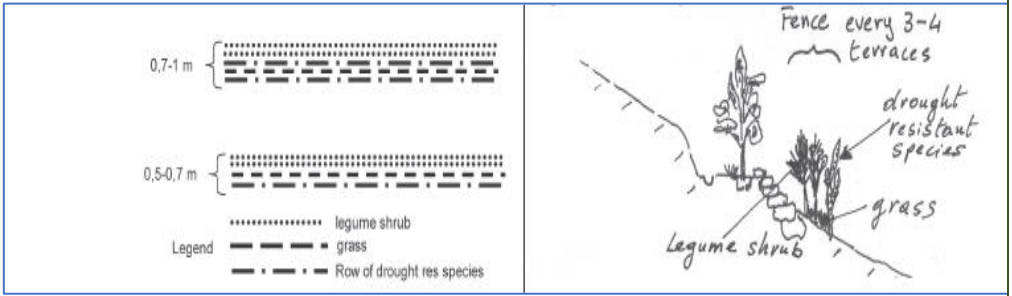
Objective	Actions
West (0.81 ha) Reestablish the forest cover with a mix of native and exotic trees	**1. Sep-Oct 2022** The planting during the September project field mission will focus on the Meanchey site close to MJP. This area has extensive remaining forests and dense bamboo climax areas. Tree seedlings should be purchased from local forest nurseries and the nurseries in Battambang and Khun Ream to identify prioritized native and exotic species and the quality and quantity of seedlings currently available. It is important to consider the available number of seedlings and ensure quality plants of good size and high survival rates in the field. This should be the basis for decision-making on what to plant in the first years. Specific plans agreed with MJP are to: • Emphasize native species • Purchase some seedlings of exotic species identified during the last field mission (if available). • Restrict planting of exotic species to existing cleared areas, preferably not well within the remaining closed forest. Even then, the exotics (e.g. Acacia spp) can be mixed with native species. • Keep the purchased seedlings in the MJP nursery until they are taken to the field. In areas of nutrient-deficient soil and areas planned for agroforestry or silvopasture, it is recommended to prioritize leguminous species that extract nitrogen from the air. Khun Ream Nursery has a production capacity of 50,000-60,000 seedlings/year of native species[1]. Not everything will be available since it is at the end of the rainy season. **Afzelia xylocarpa**  *Source: Project team*

[1] See Annex 1, for a list of native species available in the area.

Objective	Actions
	Ideally, field planting should be done at the beginning of the rainy season, when the plants have the greatest chances of survival. Since the planting in 2022 will be carried out close to the end of the rainy season, it should preferably be combined with watering in the field until the plants have been well settled in and have some root growth. Especially during the first two months, it is essential to water if there has been more than a week without rain. The plants should also be monitored during the dry season to review if additional field watering is required. **2. 2022 and subsequent years** After the first year, seedlings should come from MJP's nursery (see below). During the transport of seedlings to the field, it is important to be careful that they don't lose much soil and don't dry out due to the wind. They must be well watered before the trip. Treat the seedlings with care, and lift them in the box of root trainers or the soil bag from the nursery. Dig a hole much bigger than the plant's soil and put it back into the hole around it. Take away the bag before planting if it is not biodegradable (such as paper). The initial distance between plants varies according to the purpose of the plantation and whether there will be distance regulation or thinning later on. For normal forest plantations, a distance of 3 x 3 m is recommended to cover quite a lot of land for conservation purposes. This will normally not require distance regulation and can delay the first thinning compared with shorter plant distances. For agroforestry, a distance of 4 x 4 m could be appropriate. During plant growth, grass is both a friend and an enemy. While removing grass close to the plants is necessary because of competition for water and nutrients, some grass around could be useful to give protective shade and save the plant through the first dry season. During the following rainy season, it could be necessary to weed and cut grass to reduce competition. The grass that is being cut should be left around the plant as green manure and be a protective mulch for the soil against drought, erosion, and the growth of weeds. During the following years, the trees will typically be tall enough, so no grass-cutting is required. **Field planting site at Takhes Menchey**  *Source: Project team* An easier and cheaper way of establishing a new forest is through direct seeding, removing the vegetation in a small spot (e.g., 30 x 30 cm), and planting many seeds, as not all will germinate. Leave some seeds just below the surface and others above the surface. Water the spot well and protect it with branches to create a semi-shade in an open field. The method is most efficient at the beginning of the rainy season. A similar effect would be achieved by inspecting the field and finding natural regeneration of useful native or exotic species. As mentioned above, the growth can be promoted by removing weeds and cutting grass around, then leaving this vegetation around each plant as a protective mulch. Use the Field Manual and Technical Assistance when available.

Objective	Actions
East (0.41 ha) Reestablish the forest cover with a mix of native and exotic trees	Actions are the same as those described for the west of the site (above).
East - Establish Nursery (0.1 ha) Y1 and produce seedlings Y1-Y5	Establish the community nursery in Year 1 to prepare plants for Year 2. The first requirement is to have a permanent source of quality water available throughout the year, from tubes, a well, or a natural source. Other factors to consider are the microclimate, soil and drainage, and an access road for transporting inputs and plants. The land should preferably be flat and have little shade (some shade is OK). Try to find a site that does not get too hot, is not too windy, and is not flooded during heavy rains. For container seedlings, it is essential to have quality soil sources available. Avoid areas that have been used for agricultural production with many pesticides. Fencing may be necessary. Produce the species mix according to the goal of site rehabilitation and number of seedlings needed. The nursery size will vary according to the type of plants, type of containers, and number of seedlings to produce. Allow space for seed beds, transplanting areas, raised plant beds, and areas for tools and inputs. On average, calculate 100-150 seedlings per m^2, and add at least 20% more to give space for the walkways between plant areas, storage, and other nursery needs. Consider that not all plant areas will be used at the same time. Even if you can produce a seedling in less than a year, it is a good rule of thumb to calculate one year from seeding until the plant leaves the nursery when you estimate its production capacity. Establish the nursery and acquire all tools and main inputs before the nursery season. Assure you have spades, rakes, hoes, saws, machetes, pruning knives, cans, a water hose, a wheelbarrow, and a large drum for water. Input material consists of soil, sand or rice husk, organic fertilizer and/or compost, water, wood stakes, strings, planting pots, bags, or root trainer containers. In the past, plastic bags were the cheapest and most common type of planting “pots.” Root trainer containers, which can be reused, are now more common. Some trees can be produced vegetatively as stumps, cutting branches from trees and putting them in wet soil. Wait until it has several branches with leaves, and cut some of them before bringing the stump to the planting area. This will ensure that there will not be too much water transpiring before the roots are settled in the new site. Plan the timing to have the seedlings ready to take to the field at the beginning of the rainy season. They should be large and strong enough to survive in the field, and any delay in the nursery process could be fatal for the plants. The plants should also not be too large before planting, which causes transport problems. Different species have different growth rates as seedlings and require different times in the nursery. The most important soil factors are nutrients (especially Nitrogen and phosphorus) and it acidity (pH). With a low content of important nutrients, add fertilizer, manure or compost, and calcium (often from limestone) for very acidic soil. Natural alternatives such as manure and compost are more favorable for the local soil flora and fauna. Add sand or other material, such as rice husk, to ensure good plant pot drainage. A good mixture will often consist of one part soil, one part manure/compost, and one part sand/rice husk mixed well. Do not use fresh manure that will burn the plants, but don’t leave the soil mix exposed for long. Give the seedlings just the right amount of good water. Too little water makes weak and slow-growing plants; too much water often leads to fungal diseases. In both cases, it can result in a high plant mortality rate. Use clean water with low organic matter, salt, and mineral content, such as iron. If these criteria cannot be fulfilled, rainwater collection or water from another source might be necessary. Use project field manual and local Technical Assistance for Years 1 to 5
East - Stabilise Drainage Line (0.23 ha)	**Sep-Oct 2022**

Objective	Actions
	Rehabilitate the main drainage line by clearing bamboo and removing debris in the drainage corridor using material cleared to create 'Leaky Dam(s)' to pool water for wildlife. Replace bamboo in the channel with native species. Leaky dams can use timber or bamboo sourced locally, placed across the stream, and secured with stakes and wires on either side of the riverbank. The tree trunks/bamboo is set above the normal stream level, so normal flow and potential fish movement are not impeded. Leaky dams only let a certain amount of water slowly drain the trapped water to reduce the flood peak. They are suited to smaller watercourses less than 2m wide. The cost of installation and ongoing maintenance is low. Leaky dams must occasionally be cleared of debris and sediment so that water can still flow through the gaps. This reduces the likelihood of water flowing over the top of the barrier. Usually, Brushwood check dams can also be recommended, but at this particular location, they are unsuitable since the stream is on bedrock. They would be suitable in other parts of the CF where the stream is not on bedrock. **Brushwood check-dams** (See Manual p24) use smaller pieces of wood woven between stakes and are usually used to stabilize small gullies. They are suitable for small streams less than 1.5-2m deep and 2-3m wide. They are composed of branches, poles/posts, and twigs, and plant species that can quickly grow through shoot cuttings are ideal. The objective of the dam is to retain sediment, slow runoff, and enhance the revegetation of stream areas. They are constructed either in single or double rows. The vertical poles are made up of thicker branches (6-10cm) and should be driven into the ground 50-60cm and spaced 30-50cm apart. Their height will depend on the stream channel's depth but should not be more than 1m above the ground. After the posts have been driven into the ground, thinner branches are interwoven through the posts to form a wall. Each branch should be pushed into the gully wall by 30-50cm. If not well established, the dams need constant checking and frequent maintenance during the rainy season. **Dry season 2022-2023** Continue drainage line rehabilitation by clearing bamboo and constructing leaky dams and/or brushwood check dams as necessary. **Wet season 2023** Monitor plantings from the previous season and infill as necessary and as seedlings become available. Check the performance of dams and maintain/change design as necessary. **Subsequent years 2024-2027** Enrichment planting of suitable species as required and constant monitoring and maintenance of dams.
East – Replace cassava/maize cultivation with trees	**Sep-Oct 2022** Allow harvesting of cassava crop and infill furrows with unrequired plant material. The aim is to replace cultivation with native and exotic trees over time so that the natives form biodiversity corridors. Progressively reduce the cultivated area within the community forest with a limited area planted with beneficial exotics but always mixed with natives. **Dry season 2022-23** Assess whether cultivation can continue: *If yes* – ensure that furrows are along the contour using A-frame if necessary, plant ridges with crop keeping tillage to a minimum, leave every (say) 5th ridge untilled to stabilize with natural regrowth or plant with vegetative fencing (see below), plant native and exotic trees in this ridge in wet season 2023. *If no* - grade along the contour and/or place stones/brushwood in furrows, allow natural regrowth to stabilize ridges, and plant with suitable trees in wet season 2023. Vegetative fencing would be a suitable soil and water conservation measure for rehabilitating cassava-cultivated land. Cashew living fences (See Manual, CT3, Annex C) are examples of vegetative fencing from Cambodia and would be suitable at Meanchey. **Vegetative Fencing** Vegetative fencing is a conservation practice that combines planting materials planted in rows with grass and legumes sowed behind these rows. They are used to protect and

Objective	Actions
	enrich reclaimed areas such as gullies, farm boundaries, and community assets. They help to control runoff and erosion and allow other valuable trees to be planted behind the fence once established. The activity can be combined with the treatment of degraded hillsides and area closure with the establishment of native and exotic trees after the fences have been established. As the diagram below shows, they could be established every (say) fifth ridge and planted with a mixture of leguminous shrubs, grasses, and trees. **Figure 18: Vegetative Fence Layout on Hillside Terrace**  *Source: Project team* **Rainy season 2023** Plant native and exotic trees and vegetative fencing as required. **Subsequent years 2024-2027** Enrichment planting of suitable species as required and constant monitoring and maintenance of planted vegetation
Explore opportunities for PES	Carry out a study on current and potentially improved ecosystem services from the site in Year 1 Enter into dialogue/negotiation with the Thai investor Y1-Y2 If negotiations are successful, improve items in accordance with the PES that were agreed Y2-Y5

A results framework should complement the table above once more concrete information is available. This would specify each action with targets and expected dates of compliance, e.g., the number of seedlings to produce and plant and hectares to rehabilitate, and it would be used as a monitoring and evaluation tool. Planting instructions, including potentially suitable species for each objective, are given in a separate planting guide.

3.1.7 Management Plan

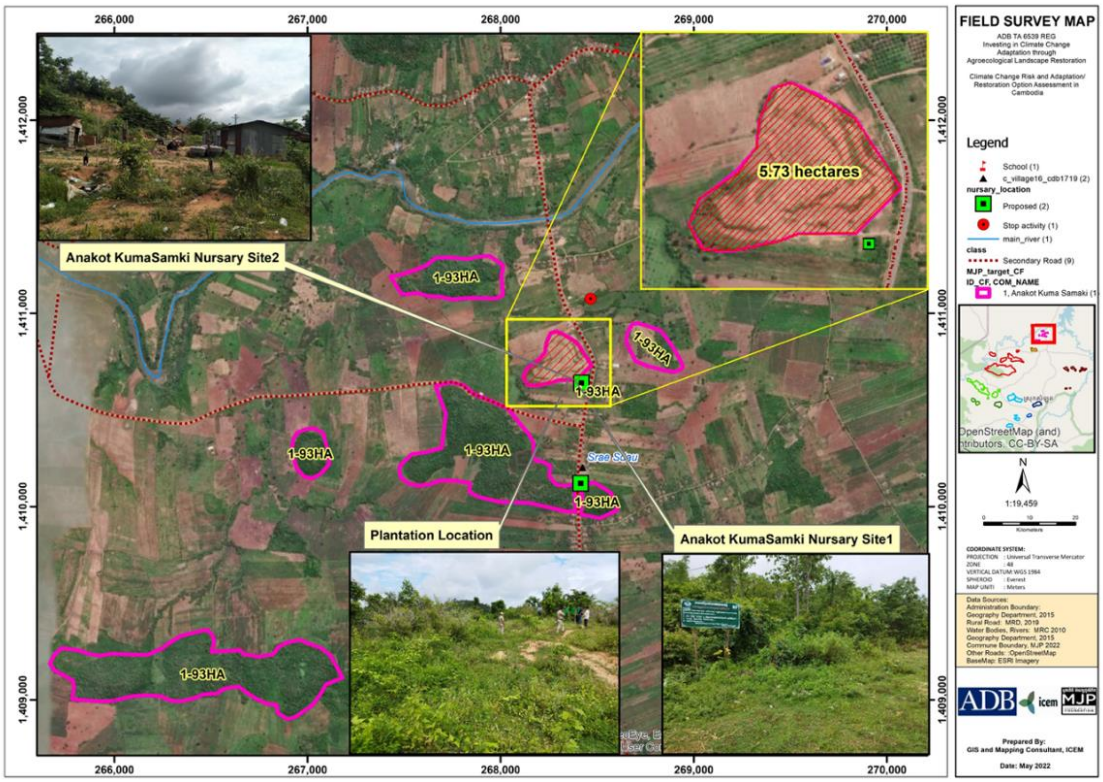
- The land management plan measures ecosystem changes and assesses the effectiveness of the restoration actions;
- Monitor and evaluate progress in a participatory way in relation to concrete targets;
- Learn from experiences and make necessary adjustments as part of an adaptive management process;
- Communicate results and lessons with all members of the local community.

3.2. Anakut Koma Samaki Restoration Plan Outline

3.2.1 Site Name and Location: Anakut Koma Samaki

The area is in Mean Chey khum (commune), Samlaut District, some 9.6 km south-southeast of Treng town and road junction at 12.752780 north, 102.866206 east (Figure 19). It covers an area of 6.7 ha.

Figure 19: Anakut Koma Samaki Resoration Site Location



Source: Geography Department 2015, MJP 2022, OpenStreetMap

3.2.2 The Vision Statement

To develop Anakut Koma Samaki into a demonstration site for successful land rehabilitation that gives environmental, social, and economic benefits to the local community.

3.2.3 Site Description

The site is a small, previously wooded hill, sitting in a landscape of agricultural land with other still wooded small hills that are part of the same community forests surrounding the site, from a few hundred meters to a few kilometers away. The agricultural land around the site is flat to gently undulating plain. It is a mixture of annual cultivation of maize and cassava with fruit tree plantations of mango, cashew, and longan.

The site forms part of the Anakut Koma Samaki Community Forest but is the only hill severely denuded. The site measures some 320 m West-East and 250 m North-South. It is bounded by agricultural land on all sides and is close to the main road to the east.

The site is notable for its lack of vegetation, bare rock, and soil extent, having been used as a source of laterite for road building in 2016 with no subsequent restoration. The south of the site is largely bare rock and deeply weathered subsoil with some ponds created by the excavation. Steeper slopes with scrub vegetation characterize the north of the site. Some natural regeneration of trees and shrubs has occurred over the last three years since the last available satellite image. The only current land used is for grazing land for a few cattle.

The site lacks vegetation, bare rock is visible, and the land is primarily used for rearing cattle.

Source: Project team

Soil erosion is not reported to be an issue at the site, with no reports of excess runoff carrying sediment onto the surrounding fields. This might be due to the small size of the area, the lack of important specific drainage lines to accumulate runoff, and the little soil left.

The current situation mapping (Figure 20) has mapped residual forests of native and exotic species at the southern boundary and associated with steeper slopes throughout the site. The rest of the area has been mapped as bare land with small patches of wetlands and ponds in the south center of the site.

Figure 20: Anakut Koma Samaki restoration zones

Source: Google Satellite image, ICEM GIS Database 2022

3.2.4 Goal of Restoration

The present plan is based on the results of the participatory methodology applied during the project mission in July 2022. The local population must decide on land use, and this document only intends to support that process. **The goal is to restore the Anakut Koma Samaki Community Forest site to an area with a species composition similar to the pre-disturbance forest that, along with neighboring**

community forest hills, can act as stepping stones in biodiversity conservation and as a demonstration site for further action in other areas. Local benefits will be due to biodiversity, soil, and water conservation, including using ponds created by the former excavation to develop a broader wetland area with enriched flora and fauna.

The rehabilitation will establish Anakut Koma Samaki as a demonstration site and visitor attraction, given the area's good road access and easily accessible high central vantage point, with opportunities for economic benefits from goods and services.

3.2.5 Objectives

Figure 21 shows the proposed restoration sites chosen by the community during field discussions and mapping in July 2022.

Main objectives for the site development:

1. Reestablishment of pre-disturbance vegetation cover with biodiversity, soil, and water conservation benefits.
2. Develop Anakut Koma Samaki as a demonstration site for community forest rehabilitation and visitor attraction.
3. Develop new economic opportunities for the local community.

Achieving these objectives will involve reestablishing historic natural vegetation by establishing wetland areas with connections between the ponds and surrounded by native vegetation, establishing a forest nursery, and erecting community buildings.

The restoration of historic natural vegetation with native species will take up to 5 years, with different areas planted annually depending on seedling availability from local nurseries. An on-site nursery should be established in the first year of implementing the restoration plan to supply trees in subsequent years, where the species should have a relation with the goal of restoration. This means priority should be given to native species, especially leguminous species that protect the soil and water resources and provide food for birds and other fauna. It would not be a goal to produce fast-growing timber species such as eucalypts, which consume much water. Alongside the nursery is establishing community buildings.

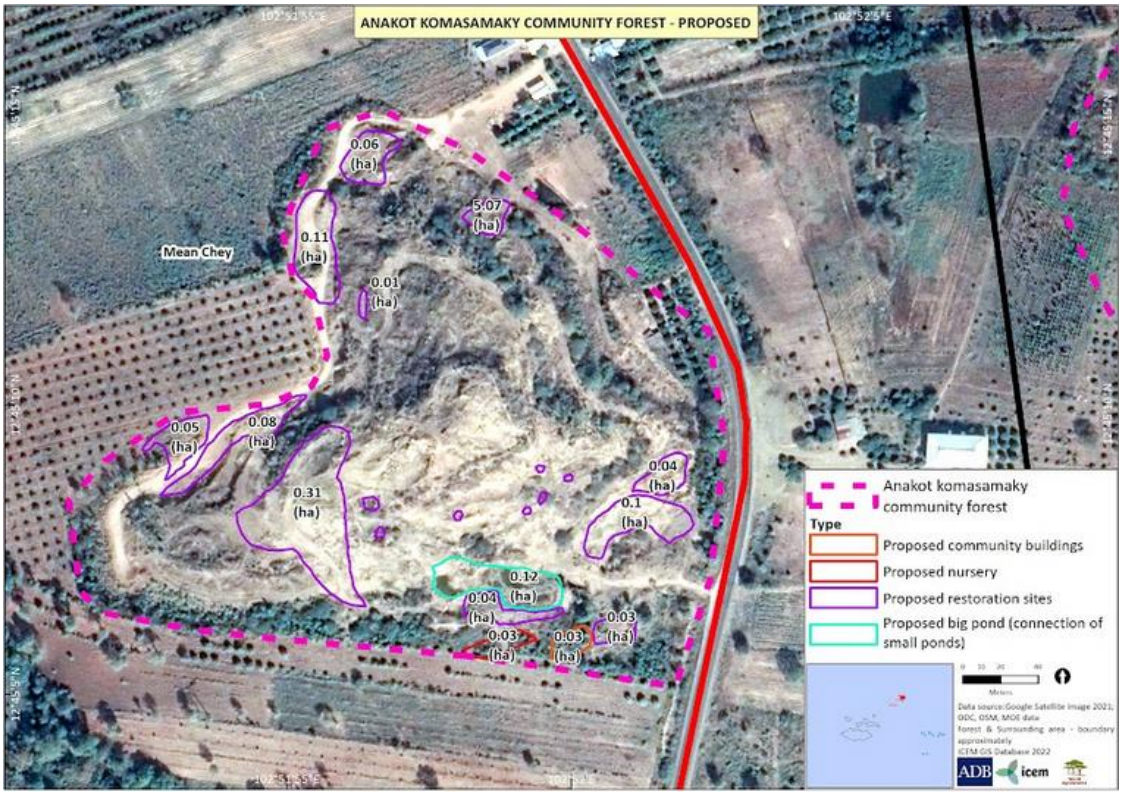
The creation of wetland areas and the development and connection of existing ponds can run alongside the restoration of natural vegetation to be fully operational in 5 years. The development of the area as a visitor attraction and showcase site can also occur as the site develops, with a priority in the early years being the construction of a path to the summit viewpoint so that the site's development can be easily monitored. The demonstration site will have two audiences: (i) Local and national political decision-makers to show on a small scale what is possible at a larger scale (ii) Tourists and local visitors who would enjoy the scenery and views of the surroundings.

Anakut contains wetlands and ponds have been dug

Source: Project team

The opportunities for local income-generating activities will depend on the community members' own initiatives but could include, e.g., (i) entrance fee and parking fee; (ii) guide with knowledge of local flora and fauna; (iii) locally made souvenirs; and (iv) sale of fruit, water, and snacks.

Figure 21: Anakut Koma Samaki sites



Source: Google Satellite image, ICEM GIS Database 2022

3.2.6 Actions

The actions required to meet each objective are outlined below.

Guiding principles for the actions are:

- Start small
- Protect the special features of the site
- Plant for diversity with native trees and shrub species
- Understand the soils – protect and enrich as needed
- Protect drainage corridors
- Establish a consistent water source
- Be aware of ecological succession to allow a diverse system to evolve
- Promote biodiversity linkages within the larger landscape
- Ensure financing in advance of any activity, including establishing nursery and buildings
- Use the project native plant guide to assist in selection of plants for the site
- Seek technical assistance (TA) whenever possible

Specific actions

Objective	Actions
Restoration of historic natural vegetation	1. Identify suitable native species from the native plant guide and from species available from nurseries locally or in Battambang. 2. Plan areas to be planted in Y1 3. Tree planting with flexible distance, based on best sites (available soil spots) 4. Source suitable species for planting in Y1 from established nurseries 5. Create on-site nursery in Y1 (see below)

Objective	Actions
	6. Plan areas to be planted and species required in Y2 7. Source suitable species from on-site nursery and off-site nurseries in Y2 8. Plant the seedlings in deep plant holes and treat the seedlings carefully (see below) 9. Repeat for Y3-5 10. Complement tree planting with direct seeding in the field and support to natural regeneration. 11. Practice Area Closure to avoid livestock entering the site in Y1-5. Area closure with fencing is most efficient and can be made with many materials, including bamboo and wire. To compensate for the few cattle currently grazing in the area, some trees should be planted for fodder (e.g., leguminous species) through cut-and-carry to cattle in neighboring areas. The measure should not allow livestock to graze there for 3-5 years, depending on the tree sizes. Area closed to cattle does not limit the development of the other income-generating activities mentioned. *12.* Monitor and maintain changing species mix as required.
Creation of Wetland Areas	**1. Sept-Oct 2022** Plant around wetland/pond and link small drainage corridors with native tree species to enhance and protect as community assets. No excavation to create larger ponds – keep the network of smaller ponds connected through corridors of native vegetation. Ponds may be deepened to increase storage, and some light excavation might be justified to allow the water to flow between ponds but always retain the regenerated wetland vegetation. **2. Dry season 2022-23** Monitor the behavior of the wetland and pond area in the dry season and plan for future works such as small brushwood dams to slow flow between ponds or overflow channel creation to speed up flow between ponds if necessary. Monitor the growth of seedlings planted in Sep-Oct 2022 and identify the source of new seedlings for planting in 2023. **3. Wet season 2023** Monitor the behavior of the wetland and pond area in the wet season and plan for future works as required. **Brushwood check-dams** (See Manual p. 24): Pieces of wood woven between stakes are often used to stabilize small gullies. They are suitable for small gullies of less than 1.5 – 2 m depth and 2-3 m wide, but smaller version would be suitable between ponds. They are composed of branches, poles/posts, and twigs, while plant species that can easily grow vegetatively through shoot cuttings are ideal. The objective of the dam is to retain sediment, slow runoff and enhance the revegetation of gully areas. They are constructed either in single or double rows. The vertical poles are made up of thicker branches (6-10 cm) and should be driven into the ground 50-60 cm and spaced 30-50 cm apart. Their height will depend on the gully's depth but should not be more than 1 m above the ground. After the posts have been driven into the ground, thinner branches are interwoven through the posts to form a wall. Each branch should be pushed into the gully wall by 30-50 cm. If not well established, the dams need constant checking and frequent maintenance during the rainy season. **4. Subsequent years 2024-2027** Enrichment planting of suitable wetland species as required, possibly using sediment traps and constant monitoring and maintenance of the wetland area. **Vegetative Fencing** Vegetative fencing is a conservation practice that consists of a combination of planting materials planted in rows with grass and legumes sowed behind these rows. They are used to protect and enrich reclaimed areas such as gullies, farm boundaries and community assets such as ponds. They help to control runoff and erosion and allow other valuable trees to be planted behind the fence once established. Vegetative fencing, if established over a large area, can be useful barriers against runoff and erosion and create 'conservation webs or nets' to trap sediment and moisture and act as windbreaks to provide some degree of tenure security. The activity can be combined with treatment of degraded hillsides and area closure with establishing high values trees after the fences have been established.

<table>
<tr><th>Objective</th><th>Actions</th></tr>
<tr><td>Forest nursery production</td><td>

1. Sept-Oct 2022

Procure seedlings from established nurseries in Y1. Try to obtain native species while ensuring that the community members are convinced about the species to plant and their benefits in the short and long run, considering soil & water conservation, biodiversity, and local livelihoods. Avoid fast-growing species that will use a lot of water, and prioritize native species to improve biodiversity and leguminous species to improve the soil conditions. Khun Ream Nursery has a production capacity of 50,000-60,000 seedlings/year of native species[2]. Since it is at the end of the rainy season, not all of them will probably be available.

Some Cambodian native forest species potentially available in the region

(leguminous species*)

Native forest species	Uses
Afzelia xylocarpa*	Wood carvings, medicinal
Dalbergia cochinchinensis*	Beautiful wood, multiple uses (in IUCN Red List of threatened and endangered species)
Dipterocarpus alatus	NTFP: Resin, paint, varnish, laquer
Dipterocarpus intricatus	Timber, resin
Hopea helferi	Timber, resin (threatened species)
Hopea odorata	Timber, resin, tannin
Sphaerocoryne affinis (= Mitrella mesnyi)	National flower: Rumduol (រំដួល). Ornamental (flower, fragrance, fruit)
Pterocarpus macrocarpus* (= P. pedatus)	Timber, ornamental, shade tree (threatened species)
Shorea siamensis	Timber, resin, medicinal
Shorea vulgaris (= S. guiso)	Timber, resin

Source: Project team

2. Dry season 2022-2023 (and subsequent years)

Establish the community nursery in Y1 to prepare plants for Y2. The first requirement is to have a permanent source of quality water available throughout the year, from tubes, a well, or a natural source. Other factors to consider are the microclimate, soil and drainage, and an access road for transporting inputs and plants. The land should preferably be flat and have little shade (some shade is OK). Try to find a site that does not get too hot, is not too windy, and is not flooded during heavy rains. For container seedlings, it is essential to have quality soil sources available. Avoid areas that have been used for agricultural production with pesticides. Fencing may be necessary.

Produce the species mix according to the goal of site rehabilitation and number of seedlings needed. The nursery size will vary according to the type of plants, type of containers, and number of seedlings to produce. Allow space for seed beds, transplanting areas, raised plant beds, and areas for tools and inputs. On average, calculate 100-150 seedlings per m^2, and add at least 20% more to give space for the walkways between plant areas, storage, and other nursery needs. The project field manual fig. 3.1 gives an example of a good local nursery design.

Consider that not all plant areas will be used at the same time. Even if seedlings can be produced in less than a year, it is a good rule of thumb to calculate one year from seeding until the plant leaves the nursery when estimating the nursery's production capacity.

Establish the nursery and acquire all tools and main inputs before the nursery season. Assure you have spades, rakes, hoes, saws, machetes, pruning knives, cans, a water hose, a wheelbarrow, and a large drum for water. Input material consists of soil, sand or rice husk, organic fertilizer and/or compost, water, wood stakes, strings, planting pots, bags, or root trainer containers. In the past, plastic bags were the cheapest and most common type of planting "pots". Root trainer containers, which can be reused, are now more common.

</td></tr>
</table>

[2] See Annex 1 for a list of native species.

Objective	Actions
	Some trees can be produced vegetatively as stumps, cutting branches from trees and putting them in wet soil. Wait until it has several branches with leaves, and cut some of them before bringing the stump to the planting area. This will ensure that there will not be too much water transpiring before the roots are settled in the new site. Plan the timing to have the seedlings ready to take to the field at the beginning of the rainy season. They should be large and strong enough to survive in the field, and any delay in the nursery process could be fatal for the plants. The plants should also not be too large before planting, which causes transport problems. Different species have different growth rates as seedlings and require different times in the nursery. The most important soil factors are nutrients (especially Nitrogen and phosphorus) and it acidity (pH). With a low content of important nutrients, add fertilizer, manure or compost, and calcium (often from limestone) for very acidic soil. Natural alternatives such as manure and compost are more favorable for the local soil flora and fauna. Add sand or other material, such as rice husk, to ensure good plant pot drainage. A good mixture will often consist of one part soil, one part manure/compost, and one part sand/rice husk mixed well. Do not use fresh manure that will burn the plants, but don't leave the soil mix exposed for long. Give the seedlings just the right amount of good water. Too little water makes weak and slow-growing plants; too much water often leads to fungal diseases. In both cases, it can result in a high plant mortality rate. Use clean water with low organic matter, salt, and mineral content, such as iron. If these criteria cannot be fulfilled, rainwater collection or water from another source might be necessary.
Field planting or direct seeding	**1. Sept-Oct 2022** Ideally, the field planting should be done at the beginning of the rainy season, when the plants have the greatest chances of survival. This is not possible for this year. Since the planting will be done toward the end of the rainy season, the plants should be watered in the field to settle in the well, and be monitored during the dry season to review if additional field watering is required. **2. All years** During the transport of seedlings to the field, be careful that they don't lose much soil and don't dry out due to the wind. They must be well watered before the trip. Treat the seedlings with care: don't grab the plant in the stem like a handbag, but lift them in the box of root trainers or the bag around the soil it brings from the nursery. Dig a hole much bigger than the plant's soil and put it back into the hole around it. Take away the bag before planting if it is not biodegradable (such as paper). The initial distance between plants varies according to the purpose of the plantation and whether you are planning for distance regulation or thinning later on. Normal forest plantations use a distance of 3 x 3 m, which requires covering a lot of land for conservation purposes. It will normally not require distance regulation and can delay the first thinning compared with shorter plant distances. An easier and cheaper way of establishing a new forest is through direct seeding, removing the vegetation in a small spot (e.g., 30 x 30 cm), and putting many seeds since not all will germinate. Leave some seeds just below the surface and others above the surface. Water the spot well and protect it with branches to create a semi-shade in an open field. The method is most efficient at the beginning of the rainy season. Cut back grass to ensure that the plants get enough light. This might be necessary at least once a year until the plants are taller than the grass.
Establishment of Community Buildings	1. Identify building requirements according to site and community goals. To reduce costs, try to establish multi-purpose buildings, e.g., for community meetings and the nursery. 2. Procure materials 3. Erect buildings
Development as a Visitor Attraction	**1. Sept-Oct 2022** Identify the outline path to the summit to facilitate the restoration process, procure materials required to build and maintain the path and prepare it as required. Building the path to the wetland area may only be feasible at this stage. **2. Dry season 2022-23**

Objective	Actions
	Develop a multi-purpose plan for the site based on a study on local demand and interest (see below). The plan should be discussed and formally agreed by the community. Continue preparing the path to the summit, facilitate access for visitors, and carry out restoration activities. **3. Subsequent years** Identify requirements for information on message boards Prepare signage at the entrance to the site with information on the history and restoration process
Local income-generating activities	1. Carry out a study on local demand and interest Y1 2. Promote income-generating activities with best potential Y1-Y2 3. Organize groups by product/service area Y1-Y2 4. Capacity building (technical and administrative) Y1-Y5 5. Incorporate the activities in the multi-purpose site plan Y1-Y2

A results framework should complement the table above once more concrete information is available. This would specify each action with targets and expected compliance dates, e.g., the number of seedlings to produce and plant hectares to rehabilitate, and will be used as a monitoring and evaluation tool. Planting instructions, including potentially suitable species for each objective, are given in a separate planting guide.

3.2.7 Management Plan

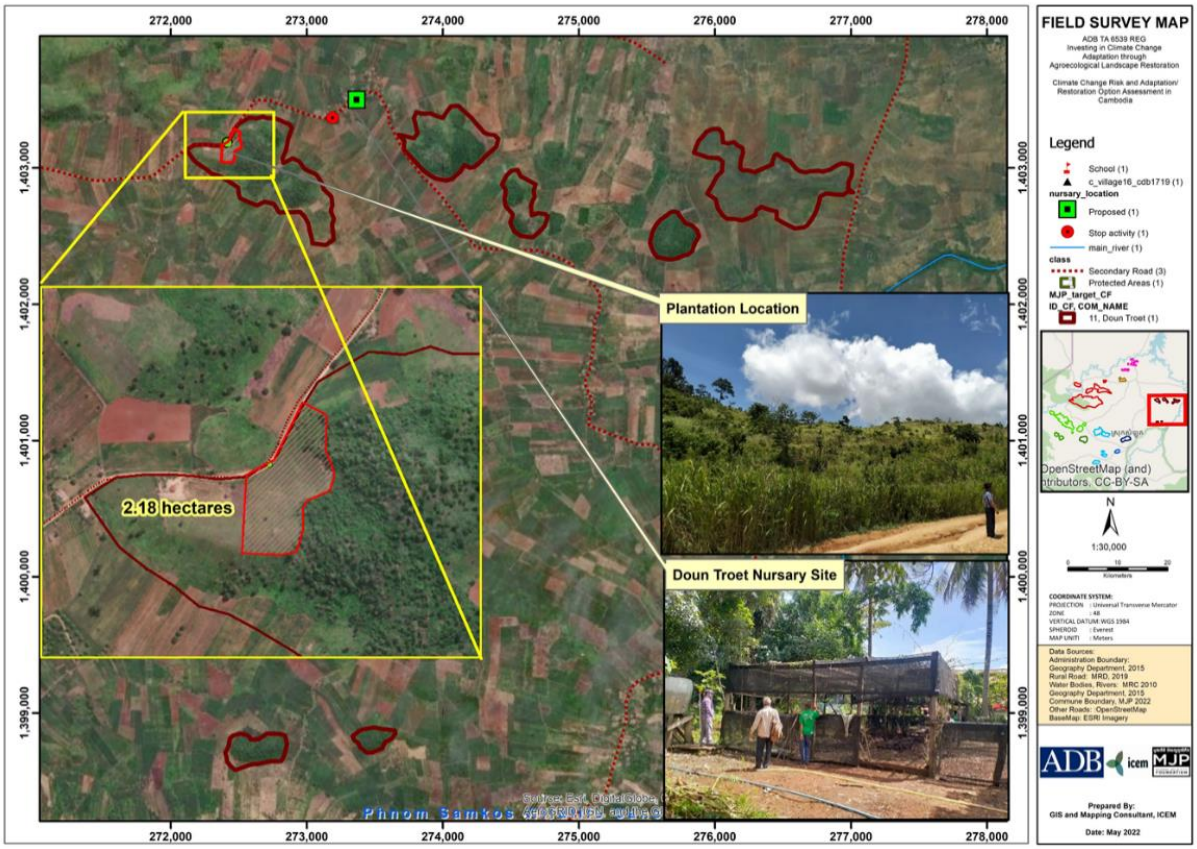
- The land management plan measures ecosystem changes and assesses the effectiveness of the restoration actions;
- Monitor and evaluate progress in a participatory way in relation to concrete targets;
- Learn from experiences and make necessary adjustments as part of an adaptive management process;
- Communicate results and lessons with all members of the local community;
- Communicate main results and lessons to visitors, including political decision-makers.

3.3. Dontret Restoration Plan

3.3.1 Site Name and Location: Dontret

The area is in Ta Sanh khum (commune), Samlaut District, some 8.9 km North East of Samlaut town at 12.683880 North, 102.905437 East (Figure 22). The community forest area is situated about 800 m SW of Dontret village. It covers an area of 44 ha.

Figure 22: Dontret Restoration Site Location



Source: Geography Department 2015, MJP 2022, OpenStreetMap

3.3.2 The Vision Statement

To develop Dontret community forest into a strengthened multiple-use area that expands and protects biodiversity, soil, and water resources while giving additional benefits to local livelihoods.

3.3.3 Site Description

The site is a ridge of hills running east-northeast - west-southwest for just over a kilometer and varying between 180-510 m in width. The hills sit in a flat, gently undulating landscape of agricultural land dominated by cassava cultivation, interspersed with fruit tree plantations of mango, cashew, and longan.

The site forms part of the Dontret Community Forest but has been degraded over time and is now a mosaic of remaining secondary forest largely confined to steeper slopes and degraded forest in the process of being converted to grass- and shrubland, as well as land either cleared for cultivation but not planted or planted with cassava with many areas of visible soil erosion.

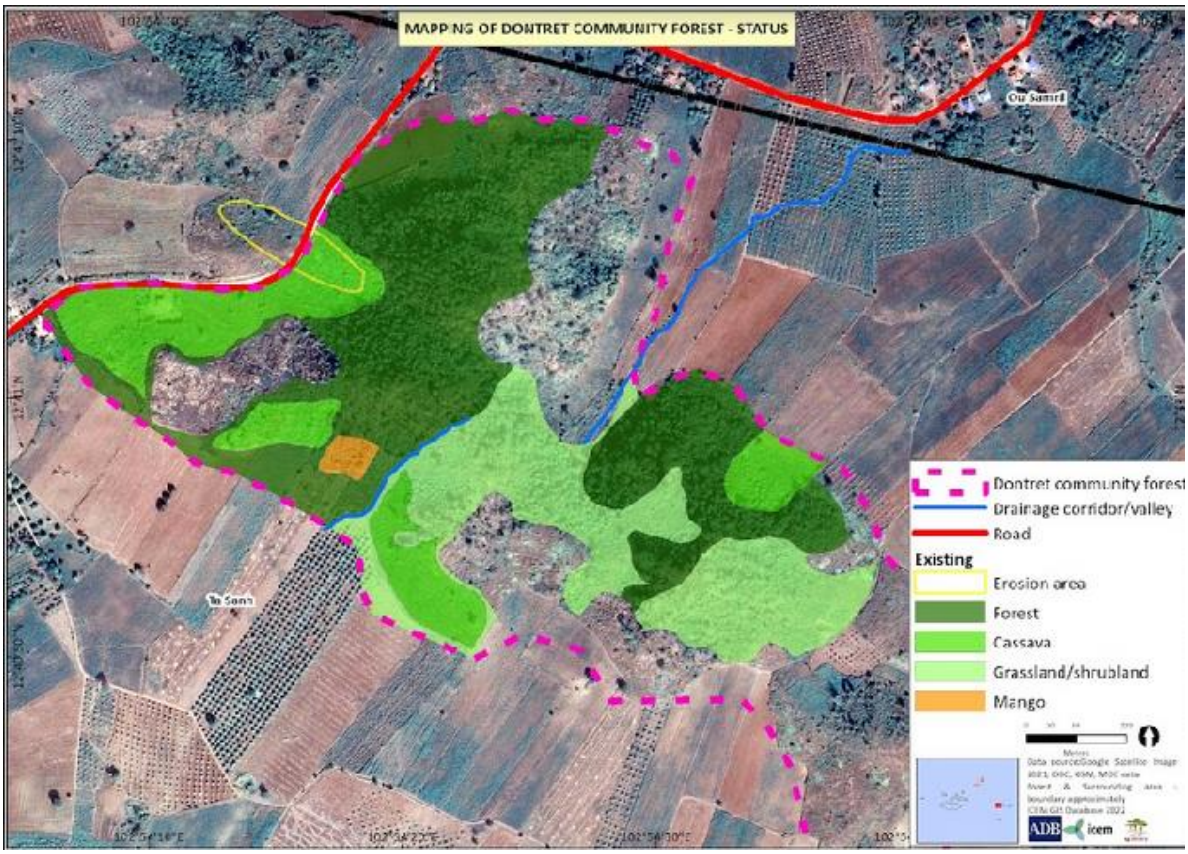
At the Dontret site land has been cleared for cultivation, and has degraded over time.

Source: Project team

The current situation mapping (Figure 23) shows two main areas of forest, in the west of the center and east of the site, an area of shrubland and grassland east of the center, and patches of cassava cultivation along the road to the west, within the forest in the center and east and grassland/shrubland in the south of the site. Two drainage lines have been mapped: northeast in the east of the area and southwest from the center of the area.

An area of soil erosion associated with cassava cultivation in the west has been identified and mapped, and more soil erosion was identified in the field to the west of the drainage line running northeast. There is no conservation agriculture practice, with cassava ridges and furrows running straight up and down the slope instead of following the contour. The track forming the western boundary has recently been upgraded. Little provision has been made for runoff control, so it is expected that it could initiate soil erosion in the future. Flooding is not reported to be an issue.

Figure 23: Dontret land uses



Source: Google Satellite image, MOE, ICEM GIS Datavase 2022

3.3.4 Goal of Restoration

The present plan is based on the results of the participatory methodology applied during the project mission in July 2022. The local population must make decisions on land use, and this document is only intended to support that process. **The main goal is to reestablish the forest cover of the Dontret Community Forest site within the boundary markers of the community forest**. The reforestation effort aims to restore the species composition of the existing forests to that similar to undisturbed forest areas in the same region, with planting and support to natural regeneration of native tree species. At the same time, in the severely degraded areas (in the process of conversion to grass- and shrubland), the reforestation will focus on agroforestry and establish a mix of native and exotic trees (including fruit) to best contribute to biodiversity, timber- and non-timber forest products to improve local livelihoods. For agroforestry, special priority will be given to Nitrogen-fixing leguminous species to improve the soils. An additional goal is to attenuate the negative impacts of rainfall by reducing runoff and soil erosion on steep slopes of the community forest area and surrounding agricultural land.

Erosion is evident in the Cassava fields in Dontret

Source: Project team

3.3.5 Objectives

Figure 23 shows the proposed restoration sites chosen by the community during field discussions and mapping in July 2022. Six sites have been identified, and they have been ranked A-F by area.

Main objectives for the site rehabilitation:

1. Strengthen the existing forest areas by re-establishing natural vegetation, introducing native tree species, and improving biodiversity.
2. Introduce agroforestry and conservation agriculture systems that will protect soil and water resources and give various products to improve local livelihoods.

To decide on the best options and species mix for each site, the residents will prioritize based on advice from the project staff and MJP.

Site A 5.07 ha

This area is degraded forest in the north centre, west of the northeast flowing drainage line. Most of the area is grassland/shrubland with some cassava cultivation, associated soil erosion, and in-field sediment deposition. This restoration aims to establish a mix of native and exotic trees and other plant species in the grassland/shrubland and cassava cultivation areas to contribute to local livelihoods.

Site B 2.99 ha

This area is degraded forest in the south center of the site. Most of the area is grassland/shrubland, with some cassava cultivation to the south.

This restoration aims to reestablish the community forest to the existent forest boundary with a mix of native and exotic trees and other plant species in the grassland/shrubland and cassava cultivation areas to contribute to local livelihoods.

Site C 1.67 ha

This area is degraded forest in the southwest of the site with relatively steep slopes. The majority of the area is grassland/shrubland adjoining cassava cultivation to the south.

This restoration aims to reestablish the community forest to the existent forest boundary with a mix of native and exotic trees and other plant species in the grassland/shrubland area to contribute to local livelihoods.

Site D 0.79 ha

This area has been mapped as 'erosion area' (Figure 23) and is situated near the road in the west of the site. The area is currently under cassava cultivation, but it is understood that the land users are aware of that the site is due to be rehabilitated. The objective of this area is to reestablish the community forest with a mixture of native and exotic tree species that will control soil erosion. There is a drainage line running through the area and this will require initial protection.

Site E 0.31 ha

This small area is degraded forest in the northeast of the site. The area is grassland/shrubland adjoining cassava cultivation to the east.

This restoration aims to reestablish the community forest to the existent forest boundary with a mix of native and exotic trees and other plant species in the grassland/shrubland area to contribute to local livelihoods.

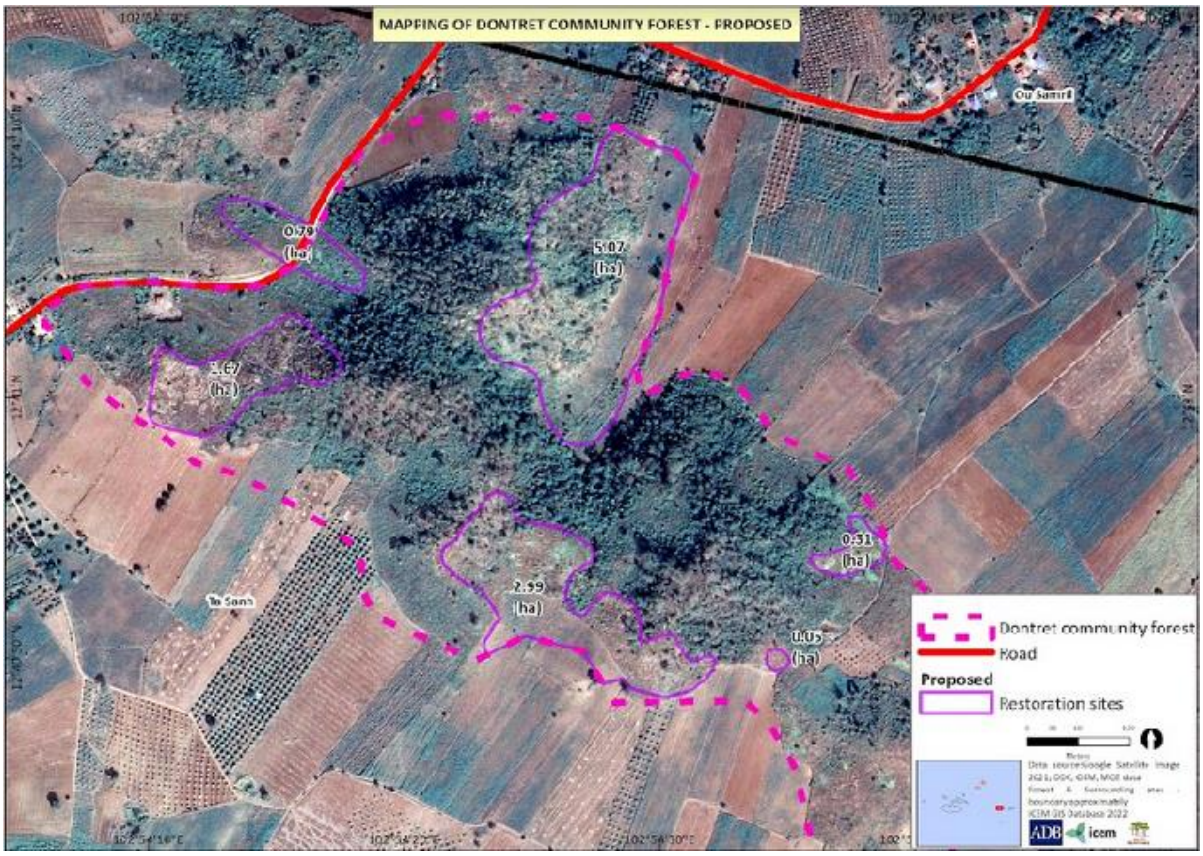
Site F 0.05 ha

This very small area is grassland/shrubland at the site's southeastern boundary.

This restoration aims to reestablish the community forest to the existent forest boundary with a mix of native and exotic trees and other plant species in the grassland/shrubland area that best contribute to local livelihoods.

The community forest restoration will take up to five years with different areas planted annually, depending on seedling availability from local nurseries. A defunct nursery in Dontret village close to the site could be rehabilitated in the first year of the restoration plan to supply trees in subsequent years.

Figure 24: Dontret Restoration Sites



Source: Google Satellite image, MOE, ICEM GIS Database 2022

3.3.6 Actions

The actions required to meet each objective are outlined below.

Guiding principles for the actions are:

- Start small
- Protect the special features of the site
- Plant for diversity, with a combination of forestry and agroforestry species that support local livelihoods
- Understand the soils – protect and enrich as needed
- Protect drainage corridors
- Establish a consistent water source
- Be aware of ecological succession to allow a diverse system to evolve
- Promote biodiversity linkages within the larger landscape
- Establish or rehabilitate a community nursery to provide forestry- and agroforestry seedlings
- Use the project field manual as a guide but with flexibility based on local conditions
- Seek technical assistance whenever possible

A nursery currently exists (left); the team plans the reforestation strategy

Source: Project team

Objective	Actions
A 5.07 ha Establish a mix of native and exotic trees and other plant species that best contribute to local livelihoods.	**Forest Area** **Sep-Oct 2022** Tree seedlings should be purchased from local forest nurseries and the nurseries in Battambang and Khun Ream, to identify native and exotic species produced and the quality and quantity of seedlings currently available. It is important to consider not only the available number of seedlings, but also that plants are of good size and a have a high survival rate in the field. This should be the basis for decision-making on what to plant in the first years, however, the project has agreed explicitly with MJP: • To emphasize native species • To purchase some seedlings of exotic species identified during the last field mission (if available). • To restrict planting of exotic species to existing cleared areas and preferably not well within the remaining closed forest. • The keep the purchased seedlings in the MJP nursery until they are taken to the field. In areas of nutrient-deficient soil and areas planned for agroforestry or silvo-pasture, it is recommended to prioritize leguminous species that extract nitrogen from the air. Khun Ream nursery has a production capacity of 50,000-60,000 seedlings/year of native

Objective	Actions
	species. However, not everything will be available since it is at the end of the rainy season. Ideally, the field planting should have been done at the beginning of the rainy season, when the plants have the greatest chances of survival. Since the planting in 2022 will be carried out close to the end of the rainy season, it should preferably be combined with watering in the field until the plants have been well settled in and had some root growth. Especially during the first two months it is important to water if there has been more than a week without rain. The plants should also be monitored during the dry season to review if additional field watering is required. **2. 2022 and subsequent years** After the first year, seedlings should come from MJP's own nursery (see below). During transport of seedlings to the field, be careful that they don't lose much soil and that they don't dry out due to the wind. They must be well watered before the trip. Treat the seedlings with care, lift them in the in the box of root trainers or the bag around the soil it brings from the nursery. Dig a hole much bigger than the plant's soil, and put it back into the hole around it. Take away the bag before planting if it is not biodegradable (such as paper). The initial distance between plants varies according to the purpose of the plantation and whether there will be distance regulation or thinning later on. For normal forest plantations, a distance of 3 x 3 m is recommended to cover quite a lot of land for conservation purposes. This will normally not require distance regulation and can delay the first thinning compared with shorter plant distances. For agroforestry, a distance of 4 x 4 m could be appropriate, and for silvopasture even a distance of 5 x 5 m. During plant growth, grass is both a friend and an enemy. While removing grass close to the plants is necessary because of competition for water and nutrients, some grass around could be useful to give protective shade and save the plant through the first dry season. During the following rainy season, it could be necessary to weed and cut grass to reduce competition. The cut grass should be left around the plant as green manure and be a protective mulch for the soil against drought, erosion, and the growth of weeds. During the following years the trees will normally be tall enough, so no grass-cutting is required. An easier and cheaper way of establishing a new forest is through direct seeding, removing the vegetation in a small spot (e.g. 30 x 30 cm) and putting many seeds, since not all will germinate. Leave some seed just below the surface and other above the surface. Water the spot well and protect it with branches to create a semi-shade if it is in an open field. The method is most efficient at the beginning of the rainy season. A similar effect would be achieved by inspecting the field and find natural regeneration of useful native or exotic species. As mentioned above, the growth can be promoted by removing weeds and cutting grass around, then leaving this vegetative material around each plant as a protective mulch. **Cassava Cultivation Area** **Sep-Oct 2022** Reduce soil erosion in existing cassava areas by creating small check dams with rocks and natural debris in furrows every few metres. Allow harvesting of cassava crop, infill furrows with unrequired plant material. The aim is to replace cultivation with native and exotic trees over time so that the natives will form biodiversity corridors. Progressively reduce cultivated area within CF with limited area planted with beneficial exotics but always mixed with natives. Specific areas can be retained for agro-forestry, using a mix of useful exotic species for fruit, nuts and timber. **Dry season 2022-23** Assess whether cultivation can continue: *If yes* – reshape furrows along the contour using A-frame if necessary, plant ridges with crop keeping tillage to a minimum, leave every (say) 5th ridge untilled to stabilize with natural regrowth or plant with vegetative fencing (see below), plant native and exotic trees in this ridge in the rainy season 2023 *If no* - grade along contour and/or place stones/brushwood in furrows, allow natural regrowth to stabilize ridges, plant with suitable trees in the rainy season 2023.

Objective	Actions
	Vegetative fencing would be a suitable soil & water conservation measure for use in rehabilitation of cassava cultivated land. Cashew living fences (See CT3, Annex C, Manual) are an example of vegetative fencing from Cambodia and would be suitable at Dontret but planted along the contour instead of the current way across the contour. Leave the existing cashew strip and plant new strips along the contour to create a lattice. **Vegetative Fencing** Vegetative fencing is a conservation practice that consists of a combination of planting materials established in rows with grass, and legumes sowed behind these rows. They protect and enrich reclaimed areas such as gullies, farm boundaries and community assets. They also help to control runoff and erosion and allow other valuable trees to be planted behind the fence once established. The activity can be combined with the treatment of degraded hillsides and area closure with the establishment of native and exotic trees after the fences have been established. As the diagram below shows, they could be established every (say) fifth ridge and planted with a mixture of leguminous shrubs, grasses, and trees. **Wet season 2023** Plant native and exotic trees and vegetative fencing as required. **Subsequent years 2024-2027** Enrichment planting of suitable species as required and constant monitoring and maintenance of planted vegetation
B 2.99 ha	As A
C 1.67 ha	As A
D 0.79 ha	As A
E 0.31 ha	As A
F 0.05 ha	As A
Rehabilitation of the local nursery in Dontret village	Start rehabilitation of the nursery in Y1 to prepare plants for Y2. Assure that it has enough quality water available throughout the year, if not, it would be necessary to take precautions so there will not be lack of water in the dry season, for instance, establish tubes from a water source. For container seedlings, it is important to have quality soil sources available. Avoid areas that have been used for agricultural production with pesticides. Establish composting in Y1 to provide planting material by Y2. Fencing of the nursery may be necessary. Produce the species mix according to the goal of site rehabilitation and number of seedlings needed. It might be necessary to increase the size of the nursery, depending on the type of plants, type of containers, and number of seedlings to produce. Allow space for seed beds, transplanting area, raised plant beds, and areas for tools and inputs. On average calculate 100-150 seedlings per m^2, add at least 20% more to give space for the walkways between plant areas, storage and other nursery needs. The project field manual gives an example of a good local nursery design. Consider that not all plant areas will be used at the same time. Even if you can produce a seedling in less than a year, it is a good rule of thumb to calculate one year from seeding until the plant leaves the nursery when you estimate its production capacity. Establish the nursery and acquire all tools and main inputs before the nursery season. Assure you have spades, rakes, hoes, saws, machetes, pruning knives, cans, a water hose, a wheelbarrow, and a large drum for water. Input material consists of soil, sand or rice husk, organic fertilizer and/or compost, water, wood stakes, strings, planting pots, bags, or root trainer containers. In the past, plastic bags were the cheapest and most common type of planting “pots”. Root trainer containers, which can be reused, are now more common. Some trees can be produced vegetatively as stumps, cutting branches from trees and putting them in wet soil. Wait until it has several branches with leaves, and cut some of them before bringing the stump to the planting area. This will ensure that there will not be too much water transpiring before the roots are settled in the new site. Plan the timing to have the seedlings ready to take to the field at the beginning of the rainy season. They should be large and strong enough to survive in the field, and any delay in the nursery process could be fatal for the plants. The plants should also not be

Objective	Actions
	too large before planting, which causes transport problems. Different species have different growth rates as seedlings and require different times in the nursery. The most important soil factors are nutrients (especially Nitrogen and phosphorus) and it acidity (pH). With a low content of important nutrients, add fertilizer, manure or compost, and calcium (often from limestone) for very acidic soil. Natural alternatives such as manure and compost are more favorable for the local soil flora and fauna. Add sand or other material, such as rice husk, to ensure good plant pot drainage. A good mixture will often consist of one part soil, one part manure/compost, and one part sand/rice husk mixed well. Do not use fresh manure that will burn the plants, but don't leave the soil mix exposed for long. Give the seedlings just the right amount of good water. Too little water makes weak and slow-growing plants; too much water often leads to fungal diseases. In both cases, it can result in a high plant mortality rate. Use clean water with low organic matter, salt, and mineral content, such as iron. If these criteria cannot be fulfilled, rainwater collection or water from another source might be necessary. Use project field manual and local Technical Assistance Y1-Y5

A results framework should complement the table above as soon as more concrete information is available. This would specify each action with targets and expected compliance dates, e.g., the number of seedlings to produce and plant and hectares to rehabilitate, and it would be used as a monitoring and evaluation tool. Planting instructions, including potentially suitable species for each objective, are given in a separate planting guide.

3.3.7 Management Plan

- The land management plan measures ecosystem changes and assesses the effectiveness of the restoration actions;
- Monitor and evaluate progress in a participatory way;
- Learn from experiences and make necessary adjustments as part of an adaptive management process;
- Communicate results and lessons with all members of the local community.

3.4. Oslev Restoration Plan

3.4.1 Site Name and Location: Oslev, Samlaut Multiple Use Area

The area is located within the Samlaut Multiple Use Protected Area, Samlaut District, some 19 km Northeast of Samlaut town at 12.701089 North 102.704599 East as shown in Figure 25. Settlers have cleared the area in the Samlaut Protected Area, which covers around 180 ha, and the area planned for restoration covers about 11.2 ha.

Figure 25: Oslev, Samlaut Multiple Use Area Resoration Site Location

Source: ICEM GIS Database 2021, Project team

3.4.2 The Vision Statement

To re-establish the natural forest cover with native species at the Oslev site in the Samlaut Multiple Use Protected Area.

3.4.3 Site Description

The site is part of a cleared area of land within the Samlout Multiple Use Area, also called the Samlout Protected Area. It slopes gently from the intact forest in the north towards a track and settlements that form the southern boundary. The area has been deforested by settlers who have established a local community. MJP and the park guards do not want to establish collaboration with the community because it could be taken as a recognition of the right to stay. Most of the cleared area is grassland and shrub regrowth, but there are also some mango plantations further south that are close to the river.

A drainage line runs down from the forest in the north towards the track in the south. Soil erosion is not an issue since the land is not intensively cultivated and ground cover is present throughout the year. It is not known if flooding is an issue since there was no communication with the local settlers.

The situation is difficult because of the lack of local collaboration and in some cases direct boycott of the reforestation activities by the local population that has settled in the area. The park guard has no possibility of being continuously present in the area to protect reforestation areas.

Areas 9.4 & 9.5 planned for reforestation.

Source: Project team

3.4.4 Goal of Restoration

The present plan is based on the results of the participatory methodology applied during the project mission in July 2022. MJP and the park guards participated in the exercise in this special case, not the local population. **The goal for the site is to restore the forest integrity through reforestation with native species found in the natural forest of the protected area.** This will lead to improved biodiversity and is a step in rehabilitating the Samlaut Multiple Use Protected Area.

3.4.5 Objectives

There were no community consultations, so the restoration objectives were not discussed with anyone other than MJP and the protected area guards. However, since it is public land, the land owner is the Kingdom of Cambodia, represented by the National Protected Areas System under MoE.

The main objectives for the site development by area are mapped in Figure 25.

Areas 9.4 & 9.5

Reestablish the arboreal vegetation cover with native forest species to restore and extend the Samlaut forest ecosystem and biodiversity value. Area 9.4 is the current forest boundary that should be reforested first, Area 9.5 can be planted later. The area is gently sloping with extensive ground cover, and there is no evidence of soil erosion, so soil and water conservation measures are not required.

Areas 9.1 & 9.2

Secure the drainage line that originates in the forest hill above, which will have the additional benefit of providing water to aid the reforestation process. Area 9.1 is the drainage line in the forest; area 9.2 is the cleared drainage line that will require revegetation.

Drainage Line (Area 9.2)

Source: Project team

3.4.6 Actions

The actions required to meet each objective are outlined below.

Guiding principles for the actions are:

- Start small
- Protect the special features of the site
- Plant for diversity, but in this case only use native species found in the same protected area
- Understand the soils – protect and enrich as needed
- Protect drainage corridors
- Establish a consistent water source
- Be aware of ecological succession to allow a diverse system to evolve
- Promote biodiversity linkages within the larger landscape
- Use the project field manual as a guide, but with flexibility based on local conditions
- Seek technical assistance whenever possible

Site Planning with rangers and local community (left) and group discussions (right)

Source: Project team

Objective	Actions
Restore Forest Cover Areas 9.4 & 9.5	**Sep-Oct 2022** Tree seedlings should be purchased from local forest nurseries and the nurseries in Battambang and Khun Ream, to identify prioritized native and exotic species and the quality and quantity of seedlings currently available. It is important to consider available seedlings and ensure quality plants with good size and high survival rates in the field. This should be the basis for decision-making on what to plant the first years. Since this is a protected area, only native species will be planted. In spots of nutrient-deficient soil, it is recommended that leguminous species that extract nitrogen from the air be given priority. Khun Ream Nursery has a production capacity of 50,000-60,000 seedlings/year of native species, including most of those mentioned in Annex 1. Currently, it is at the end of the rainy season, so not all the mentioned species will probably be available. Ideally, the field planting should have been done at the beginning of the rainy season, when the plants have the greatest chances of survival. Since the planting in 2022 will be carried out close to the end of the rainy season, it should preferably be combined with watering in the field until the plants have been well settled in and had some root growth. Especially during the first two months, it is important to water if there has been more than a week without rain. The plants should also be monitored during the dry season to review if additional field watering is required.

Objective	Actions
	2. 2022 and subsequent years After the first year, seedlings could come from MJP's own nursery or other sources to ensure enough native species are provided. During the transport of seedlings to the field, it is important to be careful that they don't lose much soil or dry out due to the wind, and they must be well watered before the trip. Days and times with the highest temperature should be avoided for transport and planting. Treat the seedlings with care, lift them in the box of root trainers or the bag around the soil it brings from the nursery. Dig a hole much bigger than the plant's soil and put it back into the hole around it. Take away the bag before planting if it is not biodegradable. Since this area has no agroforestry plan, a plant distance of approx. 3 x 3 m is recommended, covering much of the land for conservation purposes. This will typically not require distance regulation and can delay thinning compared with shorter plant distances. This area is not planted for commercial purposes, so thinning might not be necessary. During plant growth, grass is both a friend and an enemy. While removing grass close to the plants is necessary because of competition for water and nutrients, some grass around could be useful to give protective shade and save the plant through the first dry season. During the following rainy season, it could be necessary to weed and cut grass to reduce competition. The grass that is being cut should be left around the plant as green manure and be a protective mulch for the soil against drought, erosion, and growth of weeds. During the following years, the trees will normally be tall enough, so no grass-cutting is required. In the border area to the existing forest, the park guards should inspect the field to find natural regeneration of useful native species. Their growth can be promoted by removing weeds, cutting grass around, and then leaving this vegetative material around each plant as protective mulch. Water the spot well and protect it with branches to create a semi-shade if it is in an open field. Use the Field Manual, and Technical Assistance when available.
Secure Drainage Line Area 9.2	**Sep-Oct 2022** Restore 10 m buffer of drainage line using native species, keep debris in drainage line to reduce flow and promote infiltration. **Dry season 2022-2023** Construct two 'Leaky Dams' or 'Brushwood Check-dams' in the drainage line. Leaky dams can use large pieces of timber, bamboo or brush sourced locally, placed across the stream and secured into place with stakes and wires on either side of the riverbank. The tree trunks are set above the normal stream level so normal flow and potential fish movement is not impeded. They only let a certain amount of water through, slowly draining the trapped water to reduce the flood peak. They are suited to smaller watercourses less than 2 m wide. The cost of installation and ongoing maintenance is low. Leaky dams need to occasionally be cleared of debris and sediment so that water can still flow through the gaps. This reduces the likelihood of water flowing over the top of the barrier. **Brushwood check-dams** (See Field Manual p. 24) use smaller pieces of wood woven between stakes and are usually used to stabilize small gullies. They are suitable for small gullies less than 1.5-2 m deep and 2-3 m wide. They are composed of branches, poles/posts and twigs, while plant species that can easily grow vegetatively through shoot cuttings are ideal. The objective of the dam is to retain sediment, slow runoff, and enhance the revegetation of gully areas. They are constructed either in single or double rows. The vertical poles are made up of thicker branches (6-10 cm) and should be driven into the ground 50-60 cm and spaced 30-50 cm apart. Their height will depend on the gully's depth but should not be more than 1 m above the ground. After the posts have been driven into the ground, thinner branches are interwoven through the posts to form a wall. Each branch should be pushed into the gully wall by 30-50 cm. If not well established, the dams need constant checking and frequent maintenance during the rainy season. **Rainy season 2023**

Objective	Actions
	Monitor the planting from the previous season and infill as necessary and as seedlings become available. Check the performance of dams and maintain/ change design as necessary.

A results framework should complement the table above once more concrete information is available. This would specify each action with targets and expected compliance dates, e.g., the number of seedlings to produce and plant and hectares to rehabilitate, and it would be used as a monitoring and evaluation tool. Planting instructions, including potentially suitable species for each objective, are given in a separate planting guide.

3.4.7 Management Plan

- The land management plan measures ecosystem changes and assesses the effectiveness of the restoration actions;
- Monitor and evaluate progress in a participatory way;
- Learn from experiences and make necessary adjustments as part of an adaptive management process;
- Communicate results and lessons with all participating stakeholders.

Philippines Restoration Plans

Ladera farm. Philippines (photo by ICRAF).

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4.1. Restoration Plan for Mr. Valdueza's Farm in the Buffer Zone of MKRNP

4.1.1 The Demonstration Farm

The demonstration farm is designated as Buffer Zone (Valdueza). Its location is 8.083155° N, 124.927952° E with an elevation of 1,836 masl, found in Songco, Lantapan, Bukidnon and located in the buffer zone of the Mt. Kitanglad Range Natural Park (MKRNP). It is governed by the multi-sectoral Protected Area Management Board (PAMB) guided by the Park's Protected Area Management Plan. The Protected Area Superintendent (PASu) of the Department of Environment and Natural Resources (DENR) facilitates the Board and implements the Protected Area Management Plan. This is in accordance with RA 8978 (2000). Similarly, it was declared as an ASEAN Heritage Park in 2009.

4.1.2 Socioeconomic Status and Institutional Circumstances

A summary of the farmer's socioeconomic profile is shown in Table 2. Mr. Valdueza is a member of the Talaandig tribe. Accordingly, he has been cultivating the farm long before the declaration of Mt Kitanglad as a Protected Area (PA). The PASU-DENR respected the customary tribal rights of the indigenous peoples, and thus, the PASu was given a "special permit" to continue the cultivation of this particular piece of land.

Mr. Valdueza's only source of income is vegetable farming, and he makes an average amount below PHP 12,000. He obtains farm capital from loans with high interest rates. He is classified as a "below subsistence farmer", having low income, no savings, and low capacity to overcome farm losses (e.g. due to typhoons, drought, pests, etc.) and extreme decline in prices of farm products. In essence, Mr. Valdueza has low resilience and adaptive capacity to cope with adverse impacts of climate change, considering his below subsistence socioeconomic status, having just vegetable farming as the only source of livelihood and income with little family savings. His decision to take part in the forest and landscape restoration of Alanib sub-watershed prompted him to cooperate with the Mt. PAMB to gradually transform his farm inside the buffer zone into Analog Forestry to connect forest patches and corridors. Such engagement in forest and landscape restoration can be sustained by making forest restoration as condition for his continuous cultivation inside the buffer zone. Likewise, providing production subsidies, discounted or free seedlings, production loans at minimal interest, crop insurance, price and market security, and training would help him address small farmers' constraints to venturing into a tree-based cropping system. The prospect of linking his farm to analog forestry and mountain trekking ecotourism at Mt. Kitanglad could be an added incentive for pursuing his vision towards this end.

Table 2: Farmer socioeconomic profile

No.	Parameter	Indicator	Description
1	Socio-economic status	a. Average monthly income	Less than P12,000
		b. Land holding (ha) and tenure	1 hectare or less than with no Tax Declaration because it is part of the PA
		c. Income source(s)	Just vegetable farming
		d. Capitalization capacity	Loans with exorbitant interest
2	Farmer category	Below subsistence	• Low Income and no monthly savings • Food as the main household expense • Locked into the vicious cycle of poverty and indebtedness
3	Institutional circumstance	Inherent resource endowment	The farmer has a forest clearing inside the buffer zone of Mt. Kitanglad PA as an inherited farmland from parents prior to the Proclamation RA 8978

No.	Parameter	Indicator	Description
4	Forest and landscape restoration scheme	Agroecological transformation pathway	Mixed tree-based cropping with agroforestry towards Analog Forestry system
5	Appropriate incentive system for sustained participation	Driving motivation for sustained engagement	• Forest restoration as condition for continually cultivating in the buffer zone of the PA • Production subsidies • Discounted or free seedlings • Production loans at minimal interest • Crop insurance • Price and market security • Training
6	Climate change adaptation level	Level of resilience and adaptability to CC impacts	Low adaptive capacity because farming household just relies on vegetable production, besides the absence of family savings

4.1.3 Site Description

This farm is located in Brgy. Songco, Municipality of Lantapan, Province of Bukidnon. Songco is an upland village which partly occupies MKRNP. The Park is home to 661 plant species from 264 genera and 106 families (Amoroso *et. al*., 2011). It shelters 58 mammals, including bats, squirrels, mice and rats, civets, deer, etc., making its mammal diversity higher than Mt. Apo's (Heaney *et. al*., 2006). In terms of importance, the Park is home to 92 threatened plant species, 82 rare plant species, 108 endemic plant, 50 economically important plant species, and 56 newly recorded plant species in the locality, and 20 newly recorded plant species in the Philippines (Amoroso *et al*., 2011). The critically endangered Philippine Eagle and the world second largest flower, *Rafflesia schadenbergiana*, is also found in the Park (DENR-B+WISER, 2015). Other ecosystem services provided by the Park include its cultural services, being home to ethnic groups Talaandigs, Higaonon, and Bukidnon, provisioning services such medicine, non-timber and timber forest products (NTFPs), and freshwater. For instance, it is source of water for domestic, agricultural, industrial, and commercial uses in low-lying areas.

Based on the interview with the farmer-claimant, this farm is an additional farm as he has another farm near the village, but has decided to maintain this farm inside the PA. This demonstration site which is the farthest from the Songco Village is approximately 3 km via the old logging road and requires some three hours of intensive hike as the old logging road is not passable to any form of vehicle. Only animal-drawn carts or horses could be used to haul produce or any implements to the farm like fertilizers or pesticides.

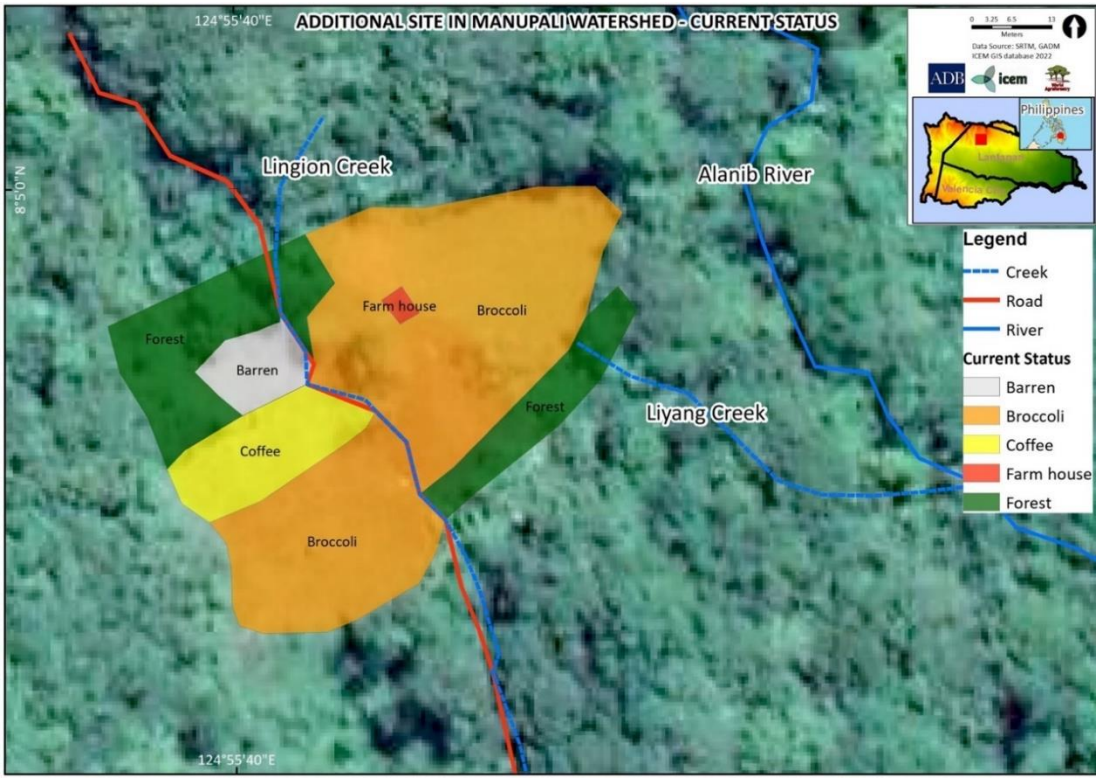
The current land use or cover of the demo farm is presented in Figure 26 based on the farmer's input during the participatory mapping exercise held last July 29, 2022. The farm is planted with broccoli and coffee. The farmer is focused only on economic gains from the land. This provides an opportunity to demonstrate how indigenous upland practice could interphase with agro-ecological approaches in managing and conserving portions of the PA while simultaneously ensuring the farmer's economic objectives.

The area is moderately steep, which might indicate that it is erodible. The farm is bisected by the Lingion creek and an old logging road while Liyang Creek is in the farm's southeast boundary, draining into the Alanib River. The water source for the farm is the creek.

Surrounding the farm are natural forests with native trees like Tagbak, katii, and Bayanti. The remaining thick tree cover of the PA is still observable as seen in Figure 26. The remnant forest could be a rich source of natural regeneration for biodiversity expansion, C sequestration, and protection of drainage systems from soil erosion.

There are remnants of the previous forests, but these are in the fringes and the area's steeper portion. Species include tree ferns, Philippine oak (ulayan), Philippine chestnut, katii, tagbak, (wild berry), bayanti, Anii, kalamagan (local name but also referred to as white maple) and Huag (possibly *Podocarpus* spp specifically Igem).

Figure 26: The current land use status of the Valdueza Farm (July 2022).

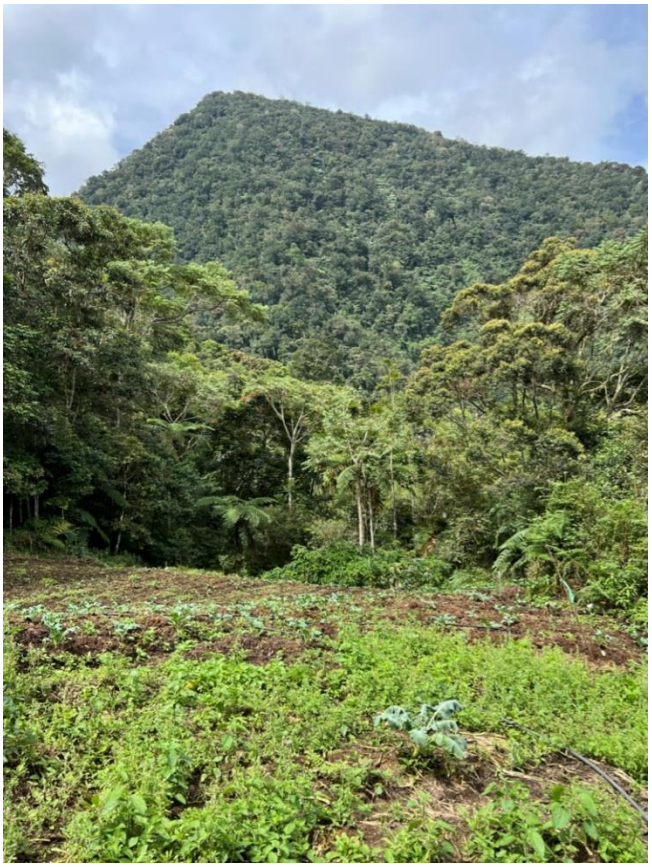


Source: Project team

Panoramic view of the Buffer Zone (Valdueza) demo farm in MKRNP. Vegetable crops are in the foreground, with remnant MKRNP forest in the background.

Source: Project team

Another perspective of the Buffer Zone (Valdueza) demo farm in Mt. Kitanglad Range Natural Park. The lush vegetation includes the Philippine Oak, one of the most common tree species in the Park (July 2022)



Source: Project team

Figure 27: The natural forest adjacent to the demo farm

Source: Project team

4.1.4 Goal of Restoration

The Buffer Zone (Valdueza) demonstration site aims to demonstrate the restoration of ecological integrity and enhance human well-being towards creating climate-resilient ecosystems using local indigenous knowledge system (IKS) and appropriate agro-ecological approaches in PAs.

4.1.5 Objectives

The buffer zone area is an extra layer of protection around the PA. Communities can assist in arresting the threats to the PA, provided that their activities adhere to a management plan prepared by the PAMB and following globally accepted management practices for PAs. The primary objective of restoration is to demonstrate local IKS and agro-ecological techniques that could interphase with the conservation and, the restoration plan will aim to achieve the following objectives: development of the PA buffer zone both for the enhancement of protection of the PA while simultaneously addressing farmer's economic objectives. Specifically:

a) Protect the remaining natural forest from further disturbance.
b) Improve the hydrological system in the site.
c) Promote biodiversity conservation in the buffer zone.
d) Enhance livelihood opportunities of the forest indigenous community.

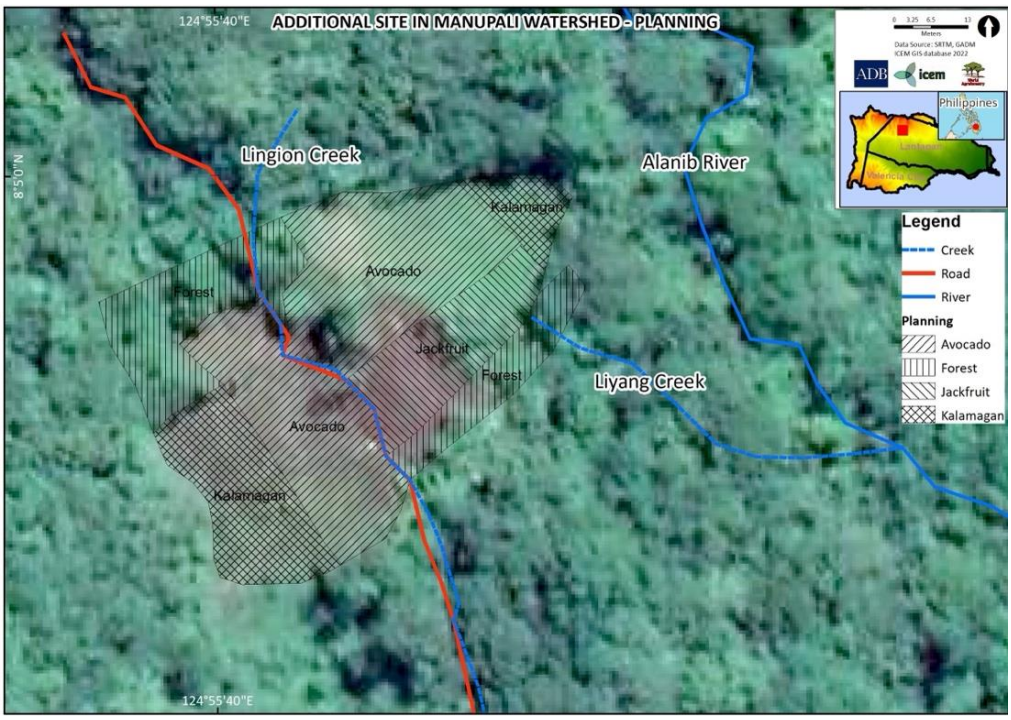
4.1.6 Actions

A combination of IKS and agro-ecological approaches, particularly nature-based solutions, will be employed to achieve the objectives of the Valdueza demo farm.

Participatory farm planning was conducted in July and October 2022. The first output (July 2022) is illustrated in Figure 28 while a revised version is shown in Figure 31. Initially, it was only a combination of fruit trees (jackfruit and avocado) and native trees like kalamagan. However, it evolved into a more complex agroforestry system as shown in Figure 31 and Figure 32. The farmers will use a combination of agroforestry systems with suitable soil and water conservation measures and local IKS. Likewise, the Analog Forestry approach will be the restoration trajectory for the future. The farmer will continue to plant vegetable crops in alleys, but hedgerows will be planted for fruit trees, coffee, and root crops to arrest soil erosion while increasing farm income.

Additionally, a combination of native trees, fruit trees with coffee and vines (NTFPs) will be planted around the boundary of the demo area to protect the adjacent natural forest and prevent further forest degradation but at the same time with economic provisions for the farmer. An active partnership with the DENR PASU is critical to achieving the objectives of the demo farm. In addition, the farmer cooperator will be exposed to capacity-building programs to enhance his capability in sustainable upland farming, agroforestry, and restoration and increase his environmental awareness to shape his moral responsibilities.

Figure 28: The planned land use of the demonstration site in the demonstration site within the Mt. Kitanglad Range Natural Park based on the workshop held last July 29, 2022



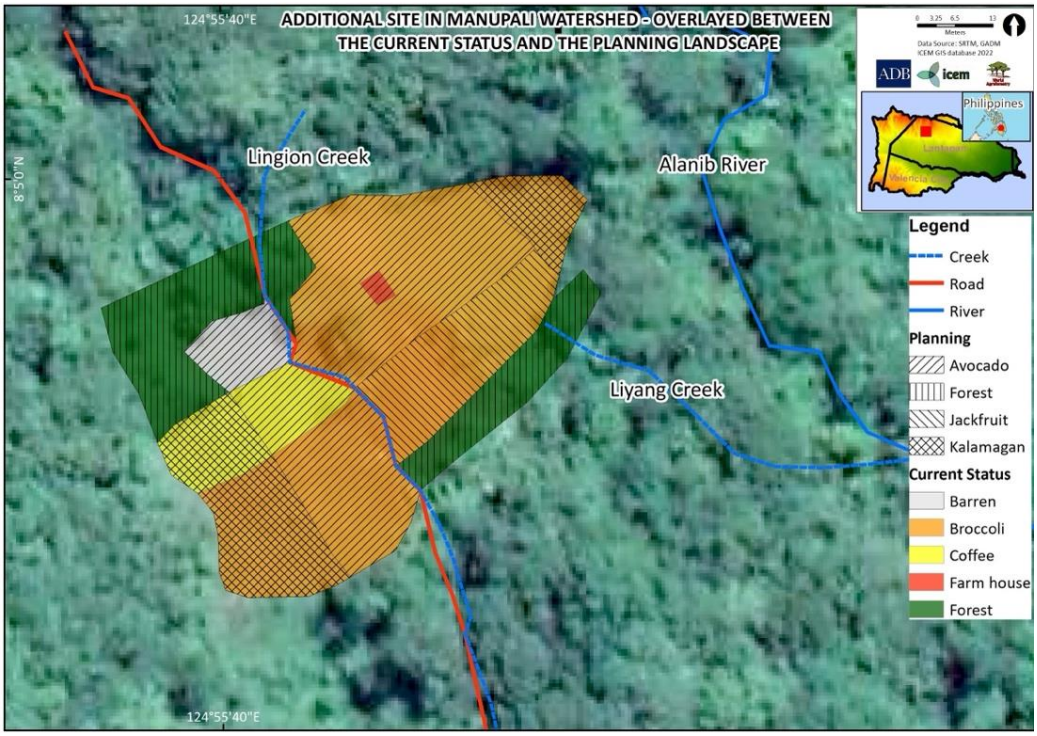
Source: Project team, ICEM GIS Database 2021

4.1.7 Phasing Approach

The plan is to fully restore the entire target site; however, the resources available for the project are limited. The planned actions should be phased, with the most critical activities addressed first. The crop phasing plan is presented in Table 3, while the target configurations are shown in Figure 29, Figure 30, Figure 31 and Figure 32.

To ensure that the economic objectives of the farmer are addressed, crops will be planted in the first three years, particularly vegetables (broccoli, carrots). Diversification and crop rotation are essential in promoting resiliency; thus, other crops like passion fruit, root crops, tea, and black pepper will also be introduced. Continued diversification will be implemented in Years 3-5 where coffee, jackfruit and avocado will be planted. Subsequently from Year 5 and beyond the introduction of native trees and NTFPs will be implemented. Although some early plantings of native tree species could be done, enriching the farm with native trees will be in full swing at this stage. This will include kalingag, almaciga, kalamagan, bagamanas, rattan and lapnisan. When this planned cropping system is accomplished, the desired restoration of ecological integrity and human well-being will be achieved.

Figure 29: The planned land use change as an output of the participatory mapping exercise on July 29, 2022

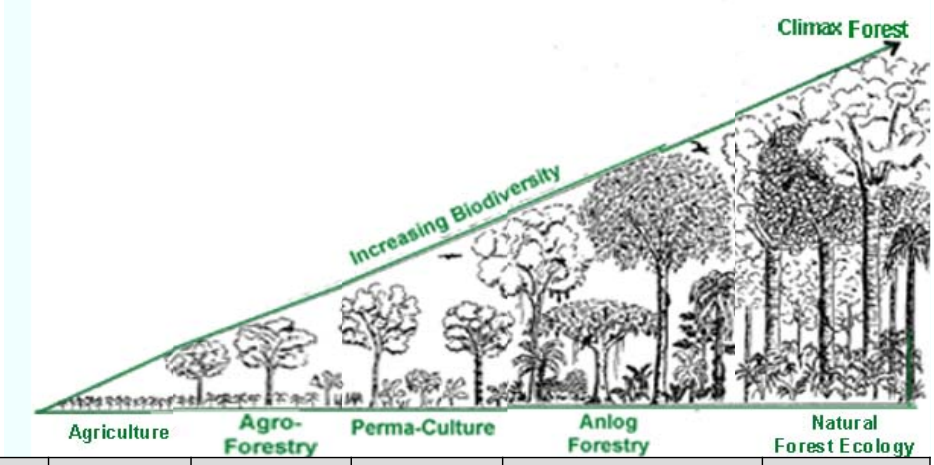


Source: Project team, ICEM GIS Database 2021

Table 3: Crop phasing pattern in the Buffer Zone (Valdueza) demo farm

Sources of income	1-3 years	3-5 years	5 years +++
Short-term	Vegetables → Passion fruit → Rootcrops → Tea → Black pepper →	→	→
Medium-term		Coffee → Jackfruit → Avocado →	→
Long-term			Kalingag → Rattan → Almaciga → Lapnisan → Kalamagan → Bagamanas →

Figure 30: Projected succession due to management interventions in the Buffer Zone (Valdueza) towards a late succession forest



Evolution Period	0	3-5 years	5-20 years	20 + years	50 +years
Vegetation	Vegetables	Mixed	Tree-based	Native timber & fruit trees + perennial + vines + rootcrops + NTFPs	Restoration of natural forest
Combinations	Potato-cabbage-carrots-lettuce	Jackfruit+ avocado+ coffee+passion + veges + rcrops	Kalingag+ jackfruit+ avocado+ coffee+vines+ passion+NTFP	Kalingag + jackfruit + avocado + coffee + vines +passion+NTFPs	Kalingag+ jackfruit+ avocado+ coffee+ vines+passion
Function	Food+cash	Food+cash+SWC	Food+cash+ES	Food+cash+ES+ biodiversity	Food+cash+ES+ biodiversity

Source: Project team, ICEM GIS Database 2021

4.1.8 Spatial Configuration

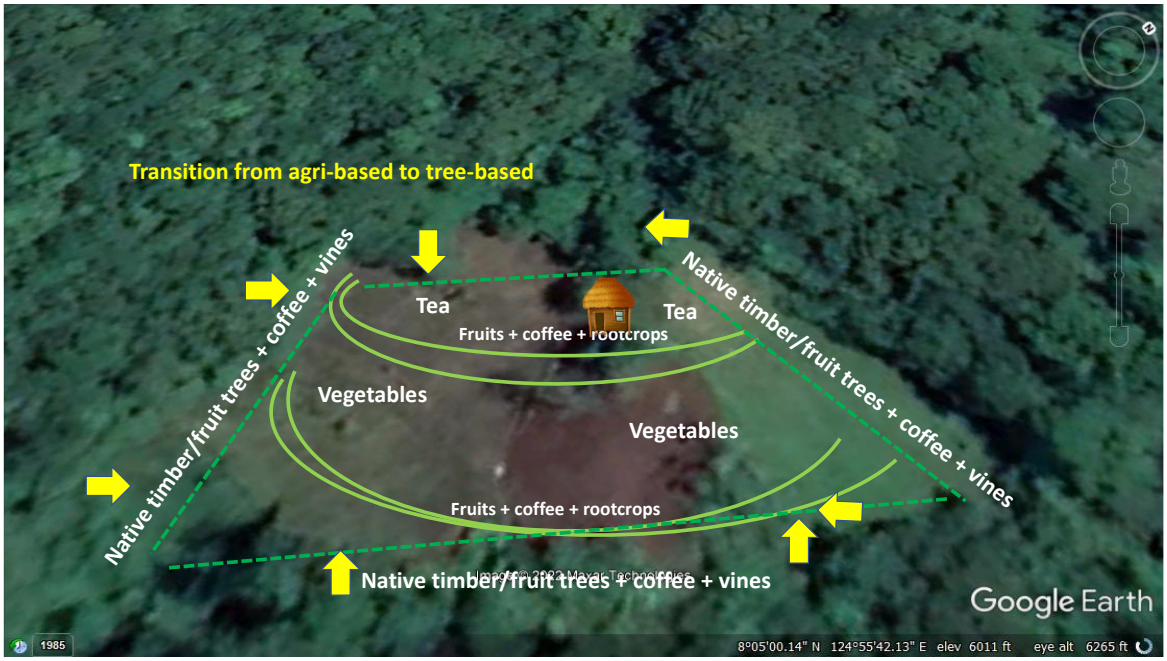
In Figure 30, the planned spatial configuration for the demo farm is overlayed in the site's Google Maps. Additional details of the planting plan is enumerated in Table 3 and Table 4. The farm's boundaries bordering the remnant forest will serve as the buffer to protect the adjacent remnant forest. For the perimeter and the adjacent forest, the following species are proposed to be planted: lapnisan, kalingag, Philippine chestnut, almaciga, kalamagan, bagamanas, passion fruit, and rattan. All the native trees will be spaced at 3 x 3 m. An estimated 340 seedlings will be required depending on the current tree density of the surrounding stands. In April 2023, 20 seedlings were planted each of the following species based on availability: kalingag, huwag/malakawayan, kalamagan and kulasi. Last July 6, 2023, 200 rattan seedlings were planted along the perimeter. Rattan would require shade from the existing native trees as well as physical support for the canes when they start to develop and grow.

Carrots and broccoli are the vegetables proposed for planting on this demo farm. Details are found in Table 4. The vegetables will be rotated to reduce pests and disease problems. Based on the slope, the vegetable alleys will be approximately 6 to 10 m. Last May 12, 2023, the farmer was provided with four packs of broccoli and two packs of cauliflower seeds[3]. Bounding the alleys on the upper and lower slopes are hedgerows with the following configuration: a single strip of natural vegetation closest to the vegetable alley. The next row will be tea at 1 x 1 m spacing, then further away from the alley will be root crops (e.g. yam) mixed with abaca spaced at 2m per abaca plant while the root crop will be 1m per root crop. This row will be closest to the remnant forest, which is needed to provide shade for abaca and some support for the yam. This will be about 1 m from the hedgerow. A modification could be employed as presented in Figure 30, where there is a row of tea and then a row of fruits + coffee + root crops. The double row of tea is spaced at 1 x 1 m offset by 0.5 m while the coffee is spaced at 3 x 3 along the hedgerow. The coffee row was supposed to be a double row, but the farmer opted for one

[3] Each pack contains approximately 100 seeds.

row for fear that the coffee trees would eventually shade the cash (agricultural) crops which could reduce his yield. Downslope after the vegetable alley, will be another hedgerow with the following configuration (Figure 30). A row of jackfruit + avocado + coffee mixed with root crops. The hedgerows promote soil and water conservation and are a viable source of income for the farmers, increasing resilience to economic and environmental change.

Figure 31: Spatial configuration of the Buffer Zone (Valdueza) demo farm refined after the October 2022 participatory planning exercise



Source: Project team

4.1.9 Species Allocation by Block

For the hedgerows, the following species are proposed: tea, yam, abaca, fruit trees (e.g. jackfruit, avocado) and coffee. Tea is an economically important species and is useful for flavorings, alcoholic beverages, baked goods pastries and puddings. Additionally, the tree is valued for its anticancer, antioxidant, and antimicrobial activities and its effectiveness in reducing body weight. Yam is an economically important species and could be resilient as far as typhoons are concerned. As such, this crop could address the critical food security issue during climate change. Abaca is another crop that grows under secondary forests and is economically valuable. This will similarly address the economic objectives of the farmer. The fruit trees with coffee are popular among farmers for their economic value. Being perennial trees (jackfruit, avocado, coffee), these trees are equally important in providing permanent cover and could therefore be important for soil and water conservation and in some way contribute to biodiversity conservation. The selected native trees (kalingag, almaciga, lapnisan, huag/malakawayan, Philippine chestnut, kalamagan, bagamanas,) are native to the Natural Park. The first five are also economically important. Almaciga has a long rotation and is valued for its expensive resin (Manila copal) while lapnisan (*Aquilaria malaccensis*) is valued for the agarwood used in perfume industry but is considered a protected species under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and International Union for Conservation of Nature (IUCN) Red List. Huag/malakawayan (*Podocarpus philippinensis*) is a valuable native tree species with conservation status classified as "Other Threatened Species" as per Department Administrative Order (DAO) 2017-11. The Philippine chestnut (*Castanopsis philippinensis*) is another native species in the MKRNP that could be planted in the proposed buffer zone. Kalamagan and bagamanas are both native tree species and are important for biodiversity conservation in the MKRNP.

Figure 32: The cropping pattern proposed in the Buffer Zone (Valdueza) demo farm

Source: Project team

Details of the planting scheme for the boundary and forest areas of the demo farm is detailed in Table 4. Lapnisan (*Aquilaria malaccensis*), kalingag (Mindanao cinnamon), Philippine chestnut, almaciga (*Agathis philippinensis*), kalamagan, bagamanas will be planted at a 3 x 3 m spacing. These will be mixed to simulate the natural forest. There is an estimated 340 m perimeter, and based on the available planting materials, all of these will be planted as a line perimeter. On the other hand, the vegetable cropping system is presented in Table 5.

Table 4: Details of the planting of the boundary and forested area in the Buffer Zone (Valdueza) demo farm

Location	Length (m)	Crop (s) to be planted	Spacing	Planting notes	Number of crops[a]	Source of planting stock	Cost (Php/ seedling)[b]
Perimeter and previous forest area	100 + 70 + 100 + 70 = **340**	*Lapnisan / Aquilaria malaccensis*	3m x 3m	Philippine Native Trees	To be confirmed depending on current tree density	Bohol/ Purchase	250
		Kalingag / Cinnamon	3m x 3m			Vards Estrada/ Purchase	75
		Philippine Chestnut	3m x 3m			Vards Estrada/ Purchase	75
		Alamaciga	3m x 3m			Vards Estrada/ Purchase	75
		Kalamagan	3m x 3m			Local/ Wildlings	75
		Bagamanas	3m x 3m			Local / Wildlings	75
		Passion fruit		Vines		BAFF / Purchase	35
		Rattan				BAFF / Purchase	35

[a]Excluding mortality allowance
[b]Including handling to planting site, excl planting costs

Table 5: Details of the planting plan of the vegetable area in the Buffer Zone (Valdueza) demo farm

Planting location	Length (m)	Crop(s) to be planted	Planting notes	Number of crops[a]	Source of planting stock	Cost (Php/ seedling)[b]
Vegetable area		Carrots	Seeds	1 quart		1500
			Chicken dung	100 sacks		250/sack
			Organic nutrient supplement	1 gal FPJ 1 gal FFJ 1 gal CalPhos 1 gal OHN 1 gal IMO		1000/gal = 5000
		Broccoli	Seeds	1 quart		1500
			Chicken dung	100 sacks		250/sack
			Organic nutrient supplement	1 gal FPJ 1 gal FFJ 1 gal CalPhos 1 gal OHN 1 gal IMO		1000/gal = 5000

[a]Excluding mortality allowance
[b]Including handling to planting site, excl planting costs

Source: Project team

The diversity of tree and crop species planned to be planted in the Valdueza Farm is expected to enrich biodiversity and increase productivity, eventually contributing to farmer's income. Likewise, resilience could be promoted to address the changing environment and markets.

4.1.10 Planting Stock Production and Procurement

Based on Landcare Foundation of the Philippines, Inc.'s (LFPI) plan, the planting stocks will predominantly be obtained from existing nurseries, which are contacts of LFPI. Information about the species, source, and prices are indicated in Table 3 and Table 4. The project's time frame does not allow the establishment of new nurseries, including the time required to raise plantable stocks. However, the long-term plan will be to develop personal or community nurseries to support the expansion of the restoration works in the watershed.

Only healthy, sturdy, vigorously growing seedlings will be purchased and transported. Large planting stocks will be preferred to maximize survival and subsequent growth and development. When delivered, seedlings will be acclimatized to reduce the transport shock.

4.1.11 Establishment of the Demo Farm

Site preparation

Contour lining will be performed in the portions of the steep farm and devoted to crops. An improvised A-frame will be utilized for the purpose. Spot weeding will be conducted for spot plantings (e.g., trees and other seedlings). Weeds and vines will be removed to prevent unnecessary competition with the planted seedlings.

As part of the restoration work, contour lines were laid out on the demo farm. Shown in the picture (center, man in blue) is Mr Juan Valdueza, the occupant of the Buffer Zone (Valdueza) site, a member of the Talaandig tribe and given tribal

Source: Project team

Staking and hole-digging

Staking will only be made for trees to be planted, but none for the remaining crops identified to be planted in the demo farm. Depending on the size of the plastic bags/container, the hole should be dug wide and deep enough to facilitate the quick settling of the ball of earth of the containerized seedlings. This will be true for the NTFPs that were earlier described.

Planting

The seedlings could be hauled manually (volunteers, e.g., students on field practice, others) or through carabao-powered sleds or horses, which are the means farmers use to haul inputs or produce to and from the farm. Care should be exercised so as not to injure or unduly stress the seedlings during transport.

Replanting

Mortalities after planting the trees will be assessed at least a month later. To ensure the planting plan is followed, seedling mortalities, especially of trees, should be immediately replaced within the planting season.

4.1.12 Maintenance of the Demo Farm

Weeding

Removal of unnecessary competition, like those from entwining vines or other weeds, should be checked as early as possible, as these could hamper the growth and development of the planted seedlings.

Fertilization

When available, fertilizers will be applied to boost the growth of the crops and trees. Decomposed manure could be used as an alternative.

Irrigation

During drought periods (presumably this year, when a moderate El Niño is predicted), the farmer may use an overhead rotary sprinkler which provides water by gravity.

Pests and disease control

The presence of pests or diseases in the crops or trees should be carefully observed and noted/recorded. This should be part of the monitoring and evaluation for the demo farms. Crop rotation and diversity of crops will be part of the integrated pest management scheme that the farmer will practice.

Indigenous practices

The Talaandigs practice a religious ritual before any planting activity which seeks the spirits of the "gods" to be pleased to prosper the planting operations. Likewise, the ritual seeks protection for all those involved in the planting operations. Indigenous practices such as this recognize the "spirits" in nature, part of the cultural beliefs of the Talaandigs.

The chicken offering which is part of the Talaandig's religious offerings prior to any planting activity

Source: Project team

Other silvicultural practices

Other silvicultural treatments or practices, particularly protection, shall be ensured. This will include protection from stray animals or wildlife. In addition, the native trees for timber production, e.g., almaciga, shall be pruned. Likewise, when the density of the trees becomes a limiting factor for further growth, particularly diameter growth, thinning should be employed to promote increased growth, particularly of the long-lived (late succession) native trees.

4.1.13 Monitoring and Evaluation

Monitoring of the demonstration farm will be done for two purposes. The first is to evaluate the progress of the learning site within the Project's duration, while the second is to measure ecosystem changes and assess the effectiveness of the restoration actions at the farm level beyond the Project's duration. These will be done by the LFPI and Village Government, respectively. Appropriate training will be conducted to implement monitoring.

The learning farm's progress and livelihood monitoring form (Annex 2) will be used monthly within the project period. For monitoring ecosystem services beyond the project, the indicators of the ecosystem services will be identified in a participative manner with the villagers. The indicators of ecosystem changes should be easily measurable, relevant, and practical. The results and lessons will be communicated to all the local community members based on the project's communications plan. The success of shifting to a tree-based system hinges on generating information that manifests the economic and ecological superiority of the proposed schemes in the demo farm. This could be demonstrated through the robust data collection the demo farm can generate.

4.1.14 Institutional Arrangements

The tenurial status of Mr. Valdueza's farm is classified as state land. From a legal standpoint, the farmer is a squatter, although the farm is located inside the Buffer Zone. Further, the lot cannot become Alienable and Disposal land by PA Law. In this regard, to arrive at a win-win solution, instead of ejecting him from his current existing squatting area, the PA Management may still allow him to continue cultivating the site on the condition that Mr Valdueza should adopt conservation farming with vegetable crops. This should be coupled with tree-based cropping system using native species and thriving in the area, towards slowly transforming his farm into Analog Forestry- a strategic forest landscape restoration pathway for connecting forest patches and corridors.

4.2. Restoration Plan for Mr. Yam-oc's Farm in the Buffer Zone of Mt. Kitanglad Range Natural Park

I. Restoration Plan for Mr. Yam-oc's Farm

4.2.1 The Demonstration Farm

The demonstration farm is designated as Buffer Zone (Yam-oc). Its exact location is 8.079058°North, 124.928546°East with an elevation of 1,748 masl, found in Songco, Lantapan, Bukidnon. Accordingly, it has been cultivated by Bienvenido Yam-oc for quite some time and has been passed on to his sons. It covers an estimate total land area of around 1.5 hectares.

Located in the buffer zone of the MKRNP, it is governed by the multi-sectoral PAMB guided by the Park's Protected Area Management Plan. The DENR-PASu facilitates the Board and implements the Protected Area Management plan. This is in accordance with Republic Act 8978 (2000). Similarly, it was declared as an ASEAN Heritage Park in 2009.

4.2.2 Socio-economic Status and Institutional Circumstances

A brief summary of the farmer's socioeconomic profile is shown in Table 6. In essence, Mr. Yam-oc has low resilience and adaptive capacity to cope with adverse impacts of climate change considering his below subsistence socioeconomic status as having just vegetable farming as the only source of livelihood and income with little family savings. His decision to take part in the forest and landscape restoration of Alanib sub-watershed prompted him to cooperate with the PAMB to gradually transform his farm inside the buffer zone into Analog Forestry to connect forest patches and corridors. Such engagement in forest and landscape restoration can be sustained by making forest restation as condition for his continuous cultivation inside the buffer zone. Likewise, providing production subsidies, discounted or free seedling, production loans at minimal interest, crop insurance, price and market security, and training would help him address small farmers' constraints to venturing into tree-based cropping system. The prospect of linking his farm to analog forestry and mountain trekking ecotourism at Mt. Kitanglad could be an added incentive for pursuing his vision.

Based on the gathered information, this portion of the Buffer Zone was illegally cultivated by the Yam-oc family some years before. The DENR-PASu made appropriate legal charges. However, due to humanitarian considerations, the charges were withdrawn in exchange for the Yam-oc Family performing rehabilitation works in this damaged portion of the buffer zone. The field observations during the reconnaissance survey of this Technical Assistance (TA) for potential demo sites revealed

that the required rehabilitation works imposed by DENR-PASu to the Yam-oc family have not been complied with. Interview with the Yam-oc family indicated their willingness to rehabilitate the area under the conditions and support of this TA. Additionally, email communication with the concerned DENR-PASu regarding the matter revealed the Office's concurrence with the proposed rehabilitation interventions of the TA, which will be assistive. Initially, a representative of the family "agreed" to include the site for the demonstration, but later the "sons" are wary that the planting of trees in the site will prevent them from further plantings, particularly of crops.

Table 6: Farmer socioeconomic profile

No.	Parameter	Indicator	Description
1	Socio-economic status	a. Average monthly income	Less than P12,000
		b. Land holding (ha) and tenure	1 hectare or less than with no Tax Declaration because it is part of the PA
		c. Income source (s)	Just vegetable farming
		d. Capitalization capacity	Loans with exorbitant interest
2	Farmer category	Below subsistence	• Low Income and no monthly savings • Food as the main household expense • Locked into the vicious cycle of poverty and indebtedness
3	Institutional circumstance	Inherent resource endowment	The farmer has resorted to clearing certain portion of the Mt. Kitanglad Protected Area for vegetable production because of dire need for a piece of land to cultivate
4	Forest and landscape restoration scheme	Agroecological transformation pathway	• Mixed tree-based cropping with agroforestry towards Analog Forestry system
5	Appropriate incentive system for sustained participation	Driving motivation for sustained engagement	• Forest restoration as condition for continually cultivating in the buffer zone of the PA • Production subsidies • Discounted or free seedlings • Production loans at minimal interest • Crop insurance • Price and market security • Training
6	Climate change adaptation level	Level of resilience and adaptability to CC impacts	Low adaptive capacity because farming household just relies on vegetable production, besides the absence of family savings

4.2.3 Site Description

This farm is located in Brgy. Songco, Municipality of Lantapan, Province of Bukidnon. Songco is an upland village which partly occupies MKRNP. The Park is home to 661 plant species from 264 genera and 106 families (Amoroso *et al*., 2011). It shelters 58 mammals including bats, squirrels, mice and rats, civets, deer, etc., making its mammal diversity higher than Mt. Apo's (Heaney *et al*., 2006). In terms of importance, the Park is home to 92 threatened plant species, 82 rare plant species, 108 endemic plant, 50 economically important plant species, and 56 newly recorded plant species in the locality, and 20 newly recorded plant species in the Philippines (Amoroso *et al*., 2011). The critically endangered Philippine Eagle and the world second largest flower, *Rafflesia schadenbergiana*, is also found in the Park (DENR-B+WISER, 2015). Other ecosystem services the Park provides include its cultural services, being home to ethnic groups Talaandigs, Higaonon, and Bukidnon, provisioning services such as medicine, non-timber and timber forest products, and freshwater. For instance, it is the water source for domestic, agricultural, industrial, and commercial uses in low-lying areas.

No actual vegetation survey of the specific buffer zone site before the disturbance caused by the Yam-oc Family is available. As a result, the vegetation cover information is based on the site's current state. The site is moderately steep. Some forest tree species used to grow in the area but were cleared to give way to the cultivated agricultural crops. The site is barren or open as the farmer stopped cultivating it but did not pursue the required rehabilitation works to make amends for their illegal encroachment. Based on an ocular assessment of these bare areas, the compacted soils indicate relatively poor site conditions, specifically the remaining grass cover. These observations may present critical challenges in the restoration works as productivity might be low particularly regarding soil properties.

On the other hand, there are remnants of the previous forests, but these are in the fringes and in the steeper portion of the area or those areas that have not been subjected to previous cultivation. Species include tree ferns, Philippine oak (ulayan), Philippine chestnut, katii, tagbak, (wild berry), bayanti, Anii, kalamagan (local name but also referred to as white maple) and Huag (possibly *Podocarpus* spp specifically Igem). The presence of these fragmented forests *cum* bare areas are common land use patterns observed in the MKRNP and in many watersheds around the country that has been continuously damaged and threatened by unsustainable upland cultivation. The current land use obtained from the Yam-oc family during the participatory mapping exercise last July 29, 2022 (Figure 33) indicated that there were vegetable crops (e.g. cabbage, potato, lettuce); however, ocular visits revealed that there are no crops currently in the area.

These were the crops the farmer had been cultivating when the illegal cultivation charges were filed against the family. The bare area is the more obvious land use in the site during the July and October 2022 visits, and it requires rehabilitation.

Close-up view of the bare portion of the Buffer Zone (Yam-oc) demo farm

Source: Project team

The picture appears to indicate the poor site condition, particularly in terms of soil properties.

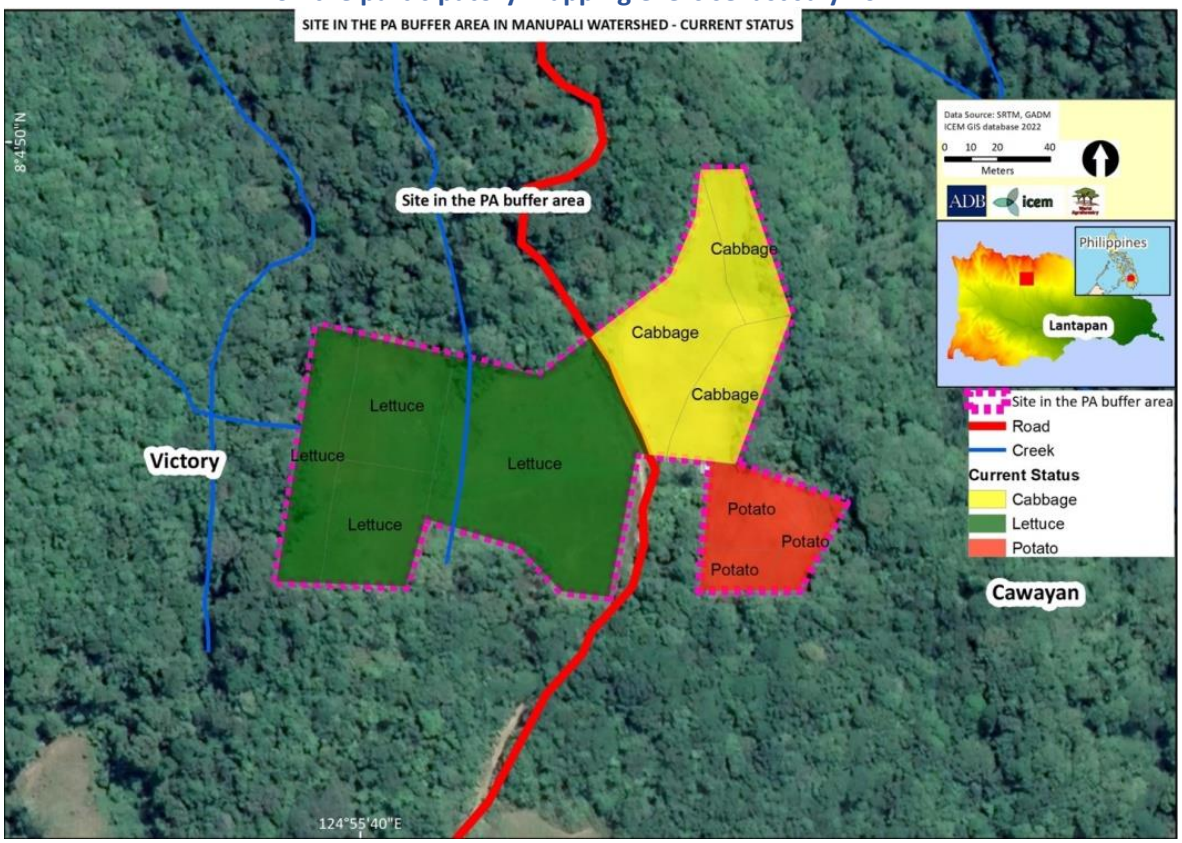
Bare portions of the Buffer Zone (Yam-oc) demo farm and the remaining natural forests in the vicinity (October 2022)

Source: Project team

Drone shot perspective of the Buffer Zone (Yam-oc) demo farm showing the bare areas and portion of the remaining natural forest (July 2022)

Source: Project team

Figure 33: The current land use status of the demonstration site in the Buffer Zone (Yam-oc) based on the participatory mapping exercise last July 2022



Source: ICEM GIS Database 2021, Project team

4.2.4 Goal of Restoration

The goal of the Buffer Zone (Yam-oc) demonstration site is to demonstrate the restoration of ecological integrity and enhancement of human well-being towards creating climate-resilient ecosystems in PAs.

4.2.5 Objectives

The buffer zone area is an extra layer of protection around the PA. Communities can assist in repelling the threats to the PA, provided that their activities adhere to a management plan prepared by the PAMB. Therefore, the primary objective of restoration for this farm is to demonstrate agro-ecological techniques/nature-based solutions that could be employed in PA buffer zones for enhanced protection of the PA while simultaneously addressing the farmer's economic objectives. Specifically, the restoration plan will aim to achieve the following objectives:

e) Protect the remaining natural forest from further disturbance.
f) Improve the hydrological system in the site.
g) Promote biodiversity conservation in the buffer zone.
h) Enhance livelihood opportunities of the forest community.

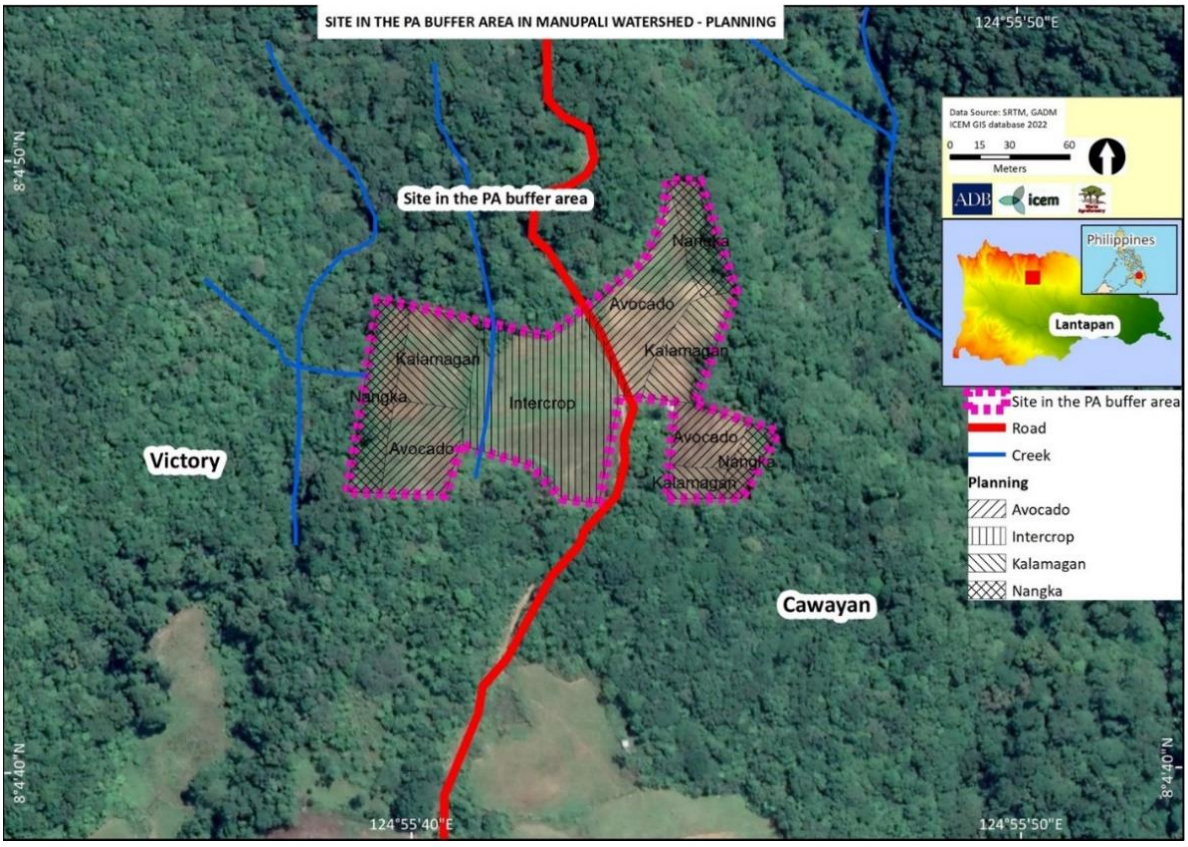
4.2.6 Actions

Based on the identified objectives of the demo site, the following actions are proposed:

a) Restore native vegetation through enrichment planting
b) Rehabilitate the bare portions of the buffer zone.
c) Practice a more sustainable upland agricultural cropping system
d) NTFPs with native timber and fruit trees
e) Restore creek in the farm
f) Increase the awareness of the farmer-cooperator.

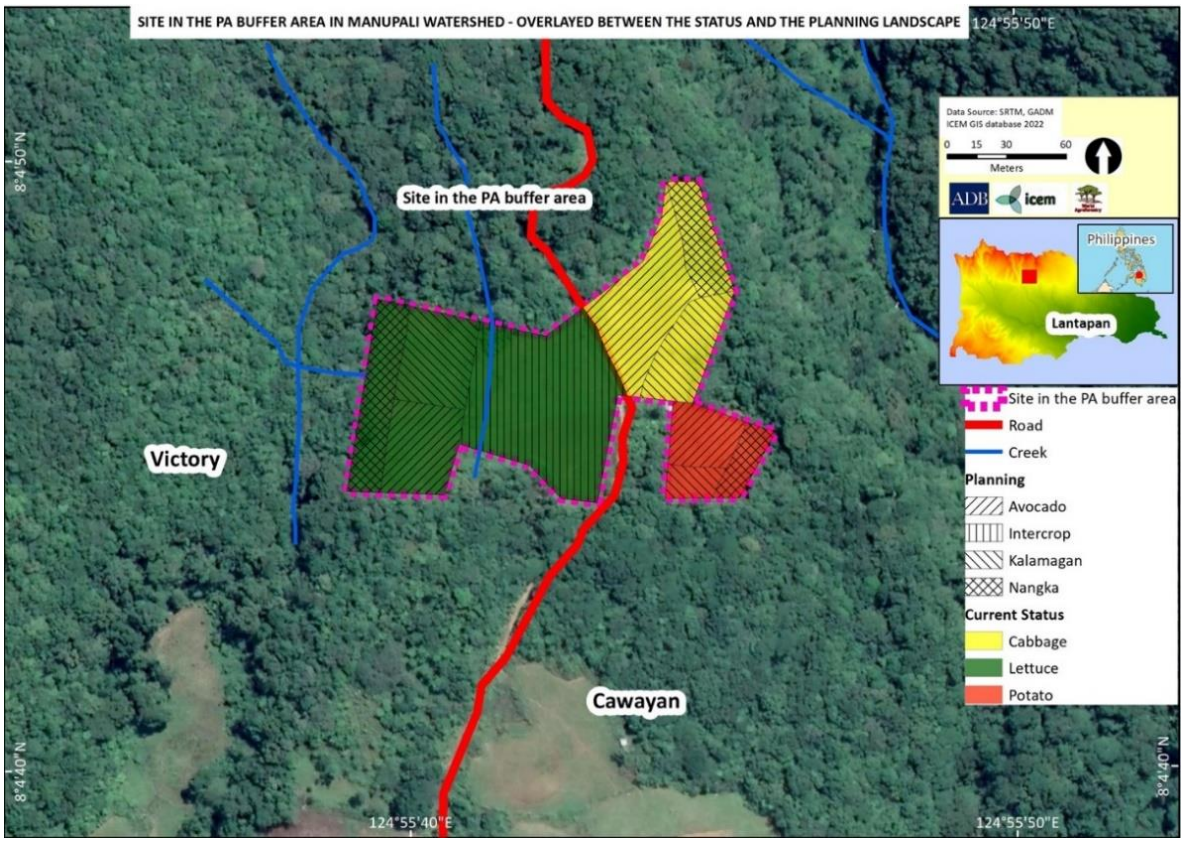
Planning had previously been conducted in July and October 2022. The first output (July 2022) is illustrated in Figure 33 while the current land use was superimposed to the planned land use in Figure 34. Initially, the participatory mapping exercise yielded a restoration plan that mainly targets planting fruit trees (avocado and jackfruit) and kalamagan. However, a more refined restoration plan was developed last October 2022 with the farmer. The farmer will use a combination of agroforestry systems with suitable soil and water conservation measures. In addition, Analog Forestry technique stands out as the model the farmers would like to adopt. Portions of the site will be enriched with native vegetation (details in the next section), which will help protect the forest remnants. Likewise, the bare portions of the site will continue to be planted to vegetables (including carrots, broccoli, and cabbage) and root crops. These agricultural crops will be planted along contour lines with hedgerows between the alleys to arrest soil erosion and consequently protect the vicinity's drainage system. Subsequently, an evolution of diversity is planned through time. Vegetables will be mixed with fruit trees and other crops, slowly diversifying into a tree-based cropping system, including NTFPs. The diversified tree-based cropping system is envisioned to provide the necessary supplemental income for the farmer while conserving and protecting the forest remnants. Additionally, biodiversity is promoted, C sequestration achieved, and hydrological systems are improved. The active partnership with the DENR-PASu is critical in achieving the objectives outlined in this portion of the demo farm. In addition, the farmer cooperator will be exposed to capacity-building programs to enhance his capability in sustainable upland farming, agroforestry, and restoration and increase his environmental awareness to shape his moral responsibilities.

Figure 34: The planned land use of the demonstration site in the Buffer Zone in the Mt. Kitanglad Range Natural Park based on the workshop held July 2022



Source: ICEM GIS Database 2021, Project team

Figure 35: The combined land use (current and planned) of the demonstration site in the Buffer Zone in the Mt. Kitanglad Range Natural Park based on the workshop held last July 29, 2022



Source: ICEM GIS Database, Project team

The laying out of the contour lines using A-Frame by the Philippine National Restoration Team last October 2022 at the Yam-oc farm

Source: Project team

4.2.7 Phasing Approach

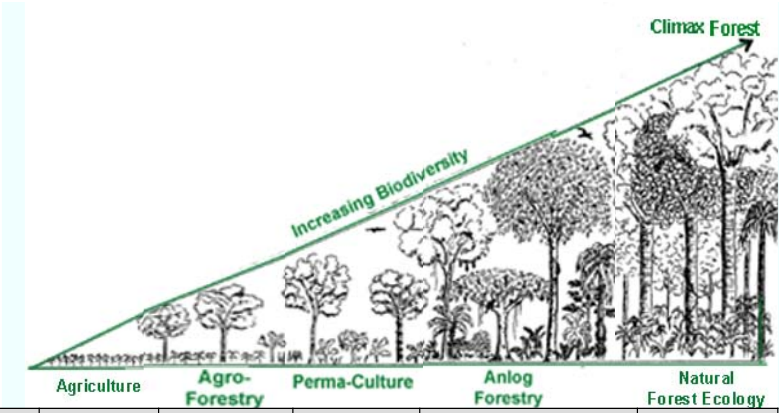
The restoration plan being proposed will cover the entire demo site. However, due to limited resources, particularly time and finances, phasing activities will be essential. This will prioritize the activities until additional resources are secured, ensuring sustainability.

To guarantee economic attractiveness to the farmers which will be critical in assuring the continued participation of the farmer, particularly in the full implementation of the restoration plan, cash crops (e.g. vegetables, abaca, root crops, tea and black pepper) will be planted in the first three years. In this initial phase, the focus will be food and cash income, meaning the economic objectives are paramount in the strategies. Specifically, vegetables such as potato, cabbage and carrots could be planted. Abaca, root crops, tea and black pepper could also be incorporated. Subsequently, particularly when the farmer has hopefully improved economic status, mixed species will be gradually introduced in Years 3-5. In this phase, fruit trees (e.g. coffee, jackfruit, avocado) will be introduced along with vegetables. This gradual shift in the cropping system is meant to slowly introduce innovations that will enhance the conservation and protection of the ecosystem from further degradation or damage, *e.g.* soil and water conservation measures, while maintaining the economic objectives of the farmer. The next phase envisions added emphasis on ecological integrity while still achieving economic benefits for the farmer, like food, cash and ecosystem services. A tree-based cropping system will be initiated after Year 5 from a mixed vegetable and fruit tree. Trees like kalingag, almaciga and NTFP like rattan, which needs shade and support could be introduced. Other trees in the buffer zone or in MKRNP could be planted, e.g. Philippine oak, Philippine chestnut and others that could be indicated in the PA plan for MKRNP. The development phasing is shown in Table 7 while the restoration trajectory through years is illustrated in Figure 36. It could be seen that a gradual shift from the current system of purely agricultural crops to a more diverse, productive, economically profitable and resilient scheme is the goal. It is envisioned that the area being a critical part of the MKRNP, which will have diverse and productive forests, will prove to be more valuable ecologically and economically than the present cropping system.

Table 7: The proposed phasing of crops in the Yam-oc Demo Farm

Phase	1-3 years	3-5 years	5 years +++
Short-term	Vegetables Abaca Rootcrops Tea Black pepper		
Medium-term		Coffee Jackfruit Avocado	
Long-term			Kalingag Rattan Almaciga

Figure 36: The desired restoration trajectory for Yam-oc demo farm through the years



Evolution Period	0	3-5 years	5-20 years	20 + years	50 +years
Vegetation	Vegetables	Mixed	Tree-based	Native timber & fruit trees + perennial + vines + rootcrops + NTFPs	Restoration of natural forest
Combinations	Potato-cabbage-carrots	Jackfruit+ avocado+ coffee+abaca + veges + rcrops	Kalingag+ jackfruit+ avocado+ coffee+vines + NTFPs	Kalingag + jackfruit + avocado + coffee + vines + NTFPs	Kalingag + jackfruit + avocado + coffee + vines + NTFPs
Function	Food+cash	Food+cash+SWC	Food+cash+ES	Food+cash+ES+ biodiversity	Food+cash+ES+ biodiversity

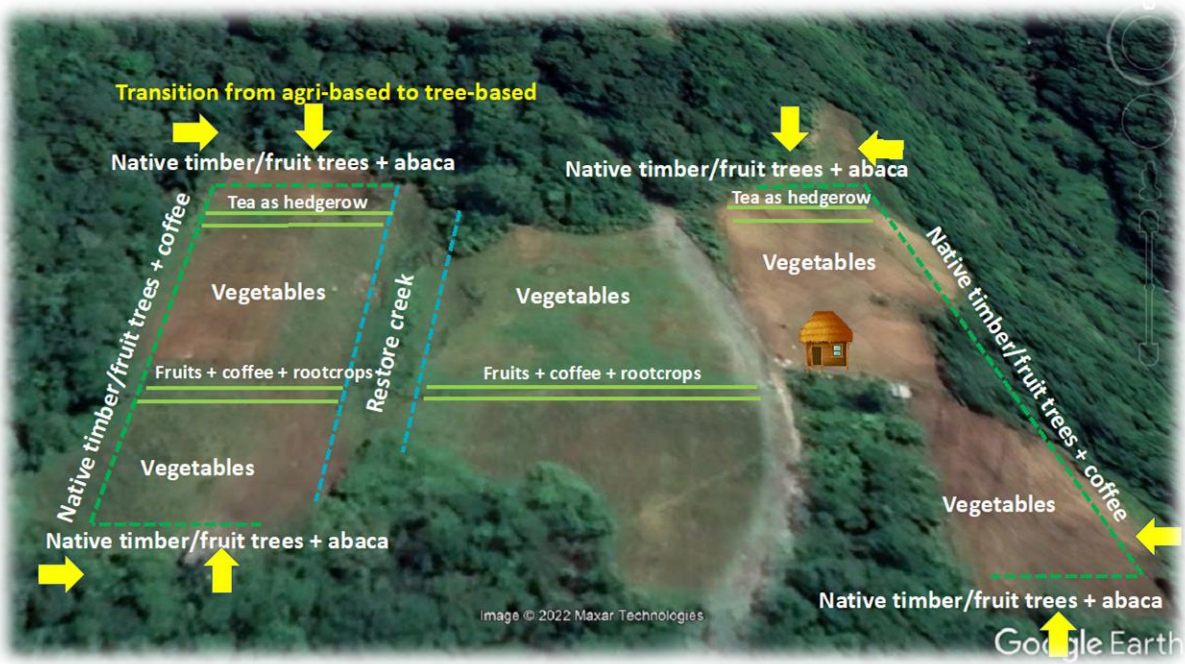
Source: Restoration team

II. Planting Guidance

4.2.8 Spatial Configuration

The planned spatial configuration for the demo farm is overlayed on a Google Maps image of the site (Figure 37). The farm's boundaries bordering the remnant forest will be planted to various native timber trees, fruit trees, abaca and coffee. The native trees proposed for planting are kalingag and almaciga, which will be spaced 10 m apart, while coffee will be spaced 2 x 2 m. This scheme will gradually transition from an agri-based cropping system to a tree-based one. Simultaneously, the strategy will serve as a buffer to the adjacent natural forest. The inner core of the demo farm is mainly planted with vegetables, which will address the farmer's immediate economic needs. There will be hedgerows to arrest accelerated soil erosion, starting at the upper portion after the native tree/fruit + abaca row. It will be composed of tea or fruits/coffee and root crops. The details of these hedgerows are presented in Figure 38. The double hedgerows comprise a natural vegetative strip (NVS) and another row of tea or a double tea hedgerow, depending on the farmer's final choice, spaced at 1 x 1 m. This top hedgerow will be followed by a vegetable alley of about 10 m. The vegetables will be planted along contour lines. The next hedgerow below will be composed of fruit trees, e.g. kamansi (breadnut), jackfruit, avocado and coffee. The coffee will be spaced at 2 x 2 m, while the fruit trees will be spaced at 10 m (to avoid shading the vegetables). After this will be the native tree/fruit trees + abaca row as described above. The row will "envelope" the demo farm, which is a buffer and a gradual transition to a tree-based system.

Figure 37: Spatial configuration of the planting plan for the Buffer Zone (Yam-oc)



Source: ICEM GIS Database 2021, Project team

Figure 38: Species allocation in the Buffer Zone (Yam-oc)

Source: Project team

4.2.9 Species Allocation by Block

Detailed information about the species to be planted could be found in the below photo, Table 8, Table 9 and Table 10. As earlier described there will be this double hedgerow of tea (*Camellia sinensis*). Around 630 tea seedlings spaced at 1 x 1 are estimated to be needed for the 150 m total hedgerow length. The species is economically important and is useful for flavorings, alcoholic beverages, baked goods pastries and puddings. Additionally, the tree is valued for its anticancer, antioxidant, and antimicrobial activities and its effectiveness in reducing body weight.

Another species that will be planted is coffee, a popular and economically beneficial crop among farmers due to the large coffee market. However, the right variety must be grown and produced depending on the market demand. The coffee seedlings will be planted in double rows above the tea hedgerow at a 2 x 2 m spacing at a length of 75 m or a total of 315 seedlings for the farm. The seedlings could be purchased from the Binahon Agroforestry Farm (BAFF) at PhP 35 per seedling.

Other fruit trees were listed as potential choices for inclusion in this hedgerow: kamansi (breadnut); rimas (breadfruit), avocado, jackfruit and banana (cardava variety). These species are all economically valuable and could contribute to the farmer's socio-economic well-being. Additionally, these species have been proven to be suitable in the area, thus ensuring optimal growth performance towards fruit production. The diversity introduced into the farm is not meant to only increase biodiversity but promote climate-resilience in the system, considering that climate change is expected to cause disruptions in the growth patterns of trees which could reverberate into the market conditions.

The fruit tree species will be alternated in the coffee row at a spacing of 10 m with an estimated number of 32. Likewise, banana (cardava) will be planted in the last coffee row also at a 10 m spacing to further enrich and diversify the fruit products in the farm. There are an estimated of 32 banana seedlings. Lastly, root crops which are considered climate-resilient crops will be incorporated. The following are recommended: gabi, camote and cassava. All spaced at 1 m with the gabi along the coffee row, then camote at 1 m above the gabi and the cassava at 1 m above the camote (Table 8).

Table 8: Details of the planting plan of the hedgerows in the Buffer Zone (Yam-oc) Demo Farm

Planting location (number of hedges)	Length (m)	Crop(s) to be planted	Spacing	Planting notes	Number of crops[a]	Source of planting stock	Cost (Php/ seedling[b]
Hedges (3+2+2)	54 + 60 + 36 = **150** 27 + 48 = **75** 45 + 45 = **90** Total = **315**	Tea (*Camellia sinensis*)	1m x 1m	Double row; within hedge	630	Cinchona Forest Reserve / Wildlings	10
		Coffee	2m x 2m	Double row; above tea	315	BAFF / purchase	35
		Kamansi / breadnut	10m. Alternating between species of fruit trees	Select among fruit trees every 10m, along coffee row	32	Vards Estrada / purchase	150
		Rimas / breadfruit				Vards Estrada / purchase	250
		Avocado				BAFF / purchase	75
		Jackfruit				BAFF / purchase	75
		Cardava Banana	10m	Within last coffee row. Between fruit trees	32	Tissue cultured / Davao de Oro – Barlaan / purchase	75
		Gabi	1m	Between coffee trees	315	Local variety	10
		Camote	1m	1m above gabi	315	Local	10
		Cassava	1m	1m above camote	315	Local	10

[a] Excluding mortality allowance

[b] Including handling to planting site, excluding planting costs

Source: Project team

The Tea Tree (Camellia sinensis) in the Cinchona Forest Reserve where wildlings of several tea species could be collected for use in the demo farms

Source: Project team

The buffer zone, the strip between the remnant forest and the farmer's production zone, will be devoted to diverse tree and plant species. This is not meant to preserve the natural forests but simultaneously provide the farmer with productive and useful permanent crops that are envisioned to be more economically valuable than the more labor-intensive, input-demanding agricultural cropping system. Again, the diversity of trees is geared towards enhancing climate resilience in the farming system.

Along the perimeter, lapnisan (*Aquilaria* spp or agarwood) will be planted at 3 x 3 m spacing. The species is highly valued these days in the medical and perfumery industries. The agarwood species is threatened by illegal cutting and protected under the CITES and IUCN Red List. No plantations of the species exist in the country, although there have been some limited efforts; therefore, planting the species will be prudent to secure agarwood's future raw material supply. These will be planted in rows at a spacing of 3 x 3 m, and it is estimated that around 60 seedlings will be planted. The seedlings could be sourced from other islands where native trees are also raised as the seedlings of the species are rare. Other sources could be the Mindanao Forest Tree Seed Center, which has established a hedge garden for the various species of *Aquilaria* spp and could be testing some stock propagation of the species.

The next species is kalingag or Mindanao cinnamon. The species has been cited to have medicinal uses for various ailments. The species has not been widely domesticated but has the potential to be an agroforestry species. These will be planted in rows at a spacing of 3 x 3 m, and it is estimated that around 60 seedlings will be planted. Again, the seedlings could be sourced from other nurseries producing native tree seedlings.

Almaciga has a long rotation and is valued for its expensive resin (Manila copal). Based on the IUCN Red List, the species is classified as "vulnerable". Due to its valuable resin and poor forest protection in the country, the number of natural trees in the wild has decreased significantly. Planting of the species is rarely practiced, while favorable policies to promote its planting are severely desired. As a native tree in the MKRNP, planting this species will encourage biodiversity and provide long-rotation trees for the future, although the precious resin could be tapped at a younger age. The species will be planted at a 3 x 3 m spacing around the farm's perimeter.

The Philippine chestnut (*Castanopsis philippinensis*) is another native species in the MKRNP that could be planted in the proposed buffer zone. Huag/malakawayan (*Podocarpus philippinensis*) is a valuable native tree species with conservation status classified as "Other Threatened Species" as per DAO 2017-11. Kalamagan and bagamanas are both native tree species and are important for biodiversity conservation in the MKRNP. These tree species will all be planted as a spacing of 3 x 3 m in the perimeter buffer zone, when the materials are available and gradually as the farmer assimilates a "tree planting" culture and veer slowly away from the pure agricultural crop cultivating system.

In addition, NTFPs like passion fruit and rattans will be planted at the base of the existing native trees adjacent to the farm perimeter. The species will be important in providing additional income to the farmer. Again, the diversity introduced into the demo farm is not merely for conservation purposes but also to enhance the climate resilience of the MKRNP ecosystem. Details of the planting plan are in Table 9.

Table 9: Details of the planting plan of the perimeter in the Buffer Zone (Yam-oc) demo farm

Planting location	Length (m)	Crop(s) to be planted	Spacing	Planting notes	Number of crops[a])	Source of planting stock	Cost (Php/ seedling)[b]
Perimeter	40 + 40 + 100 = **180** 30 + 30 + 120 = **180** Total = **360**	*Lapnisan / Aquilaria malaccensis*	3m x 3m	Philippine native trees	120 minimum	Bohol / purchase	250
		Kalingag / cinnamon	3m x 3m			Vards Estrada / Purchase	75
		Philippine Chestnut	3m x 3m			Vards Estrada / purchase	75
		Almaciga	3m x 3m			Vards Estrada / purchase	75
		Kalamagan	3m x 3m			Local / wildlings	75
		Bagamanas	3m x 3m			Local / wildlings	75
		Passion fruit		Vines		BAFF / purchase	35
		Rattan				BAFF / purchase	35

[a]Excluding mortality allowance

[b]Including handling to planting site, excluding planting costs

Source: Project team

The planting of vegetables will be integral to this demo farm as this is a major source of income for the farmer cooperator. The farmer will essentially be planting carrots and broccoli. The details of the farm inputs are found in Table 10.

Table 10: Details of the planting plan of the vegetable area in the Buffer Zone (Yam-oc) demo farm

Planting location	Length (m)	Crop(s) to be planted	Spacing	Planting notes	Number of Crops[a]	Source of planting stock	Cost (Php/ seedling)[b]
Vegetable area		Carrots		Seeds	1 quart		1500
				Chicken dung	100 sacks		250/sack
				Organic nutrient supplement	1 gal FPJ 1 gal FFJ 1 gal CalPhos 1 gal OHN 1 gal IMO		1000/gal = 5000
		Broccoli		Seeds	1 quart		1500
				Chicken dung	100 sacks		250/sack
				Organic nutrient supplement	1 gal FPJ 1 gal FFJ 1 gal CalPhos 1 gal OHN 1 gal IMO		1000/gal = 5000

[a]Number of hedges
[b]Excluding mortality allowance
[c]Including handling to planting site, excluding planting costs
Source: Project team

The diversity of tree and crop species planned to be planted in the Yam-oc Farm is expected to enrich biodiversity and increase productivity, eventually contributing to farmer's income. Likewise, resilience could be promoted to address the changing environment and markets.

4.2.10 Planting Stock Production and Procurement

Based on the procurement plan of LFPI, most of the planting stocks will be sourced from either the BAFF nursery or another native tree species dealer (Vards Estrada). Details are presented in Table 8, Table 9 and Table 10. For these seedlings, an acclimatization period prior to actual planting will be implemented to reduce transport shock. Alternatively, if wildlings could be sourced from the PA, with proper permits from the PASu, native trees from the adjacent forest could be sourced particularly for the boundary plantings.

4.2.11 Establishment of the Demonstration Farm

Site preparation

Contour lining will be performed in the steep portions of the farm and devoted to crops. An improvised A-frame will be utilized for the purpose. This could be part of the training of parents and teachers to enhance their competence in sustainable upland farming.

Spot weeding will be conducted for spot plantings (e.g., trees and other seedlings). Weeds and vines will be removed to prevent unnecessary competition with the planted seedlings.

Staking/hole digging

Staking will only be made for trees to be planted, but none for the remaining crops identified to be planted in the demo farm. Depending on the size of the plastic bags/container, the hole should be dug wide and deep enough to facilitate the quick settling of the ball of earth of the containerized seedlings. This will be true for the NTFPs that were earlier described.

Planting

The seedlings could be hauled manually or through carabao-powered sleds or horses, which farmers use to haul inputs or produce to and from the farm. Care should be exercised so as not to injure or unduly stress the seedlings during transport. Planting will be carried out during the rainy season, which will last from June to December. However, the December planting might be limited only to the first week of that month to ensure that seedlings can establish well before the rains become limited.

Replanting

Mortalities after planting the trees will be assessed at least a month later. To ensure the planting plan is followed, seedling mortalities, especially of trees, should be immediately replaced within the planting season.

4.2.12 Maintenance of the Demonstration Farm

Weeding

Removal of unnecessary competitions like those from entwining vines or other weeds should be checked as early as possible as these could hamper the growth and development of the planted seedlings.

Fertilization

When available, fertilizers will be applied to boost the growth of the crops and trees. Decomposed manure could be used as an alternative.

Irrigation

During drought periods (presumably this year, when a moderate *El Niño* is predicted), the farmer may use an overhead rotary sprinkler which provides water by gravity.

Pests/diseases

Pests or diseases in the crops or trees should be carefully observed and noted/recorded. This should be part of the monitoring and evaluation for the demo farms. Crop rotation and diversity of crops will be part of the integrated pest management scheme that the farmer will practice.

Indigenous practices

The Talaandigs practice a religious ritual before any planting activity, which seeks the spirits of the "gods" to be pleased to prosper the planting operations. Likewise, the ritual seeks protection for all those involved in the planting operations. Indigenous practices such as this recognize the "spirits" in nature, which is part of the cultural beliefs of the Talaandigs.

Other silvicultural treatments/practices

Other silvicultural treatments or practices, particularly protection, shall be ensured. This will include protection from stray animals or wildlife. In addition, the native trees for timber production, e.g. almaciga shall be pruned as long as the height of man allows. Likewise, when the density of the trees become a limiting factor for further growth, particularly diameter growth, thinning should be employed to promote increased growth particularly of the long-lived (late succession) native trees.

4.2.13 Monitoring and Evaluation

Monitoring of the demonstration farm will be done for two purposes. The first is to evaluate the progress of the learning site within the Project's duration, while the second is to measure ecosystem changes and assess the effectiveness of the restoration actions at farm level beyond the Project's duration. These will be done by the LFPI and Village Government, respectively. Appropriate trainings will be conducted to implement monitoring.

The learning farm's progress and livelihood monitoring form is presented in Annex 2, and will be used monthly within the project period. For monitoring ecosystem services beyond the project, the indicators of the ecosystem services will be identified in a participative manner with the villagers. The

indicators of ecosystem changes should be easily measurable, relevant, and practical. The results and lessons will be communicated to all the local community members most effectively, and they will also be consulted in a workshop. The success of shifting to a tree-based system hinges on generating information that manifests the economic and ecological superiority of the proposed schemes in the demo farm. This could be demonstrated through the robust data collection the demo farm can generate.

4.2.14 Institutional Arrangement

The tenurial status of Mr. Yam-Oc's clearing is classified as state land, being within Mt. Kitanglad PA. From a legal standpoint, the farmer is a squatter, although the farm is located inside the Buffer Zone. Further, the lot cannot become Alienable and Disposal land by PA Law. In this regard, to arrive at a win-win solution, instead of ejecting him from his current existing squatting area, the PA Management may still allow him to continue cultivating the site on the condition that Mr Yam-Oc should adopt conservation farming with vegetable crops. This should be coupled with a tree-based cropping system using native species and thriving in the area, towards slowly transforming his farm into Analog Forestry- a strategic FLR pathway for connecting forest patches and corridors.

4.3. Restoration Plan for Mr. Ladera's Farm

I. The Demonstration Farm

The demonstration farm of Martino Ladera, Jr. is located at Sitio Bol-ogan Songco, Lantapan, Bukidnon. Specifically, it is 8.066040°North; 124.928535°East; 1462 masl. It is approximately 0.66 km from the Village Center of Sitio Bol-ogan, along the old logging road to MKRNP and is approximately 1.2 ha. Based on the information gathered from the farmer, the farm was bought for a price of PHP 100,000.

4.3.1 Farmer Socio-economic Status and Institutional Circumstance

A brief summary of the farmer's socioeconomic profile is shown in Table 11. In essence, Mr. Ladera has moderate resilience and adaptive capacity to cope with climate change's adverse impacts, considering his above subsistence socioeconomic status as having more than one (1) source of livelihood and income with little family savings. His decision to participate in the forest and landscape restoration of Alanib sub-watershed convinced him to gradually transform his sloping vegetable farm into a conservation farming system towards tree-based cropping. Such engagement in forest and landscape restoration can be sustained by providing production subsidies, discounted or free seedlings, production loans at minimal interest, crop insurance, price and market security, and training. The prospect of linking his farm to agroforestry and mountain trekking ecotourism at Mt. Kintanglad could be an added incentive for pursuing his vision.

Table 11: Farmer socioeconomic profile

No.	Parameter	Indicator	Description
1	Socioeconomic status	a. Average monthly income	More than P12,000 but less than P20,000
		b. Land holding (ha) and tenure	More than one land holding of sizes less than 1.0 Ha. to 3.0 ha and usually not titled lot
		c. Income Source (s)	Farming and out-of-farm livelihood
		d. Capitalization Capacity	Personal and sometimes resort to borrowings with exorbitant interest
2	Farmer category	Typology: Within or Above Subsistence	• Less vulnerable to capital lender's usurious practices for farming capitalization because has little savings but not regular • Food and education are the main household's expenses

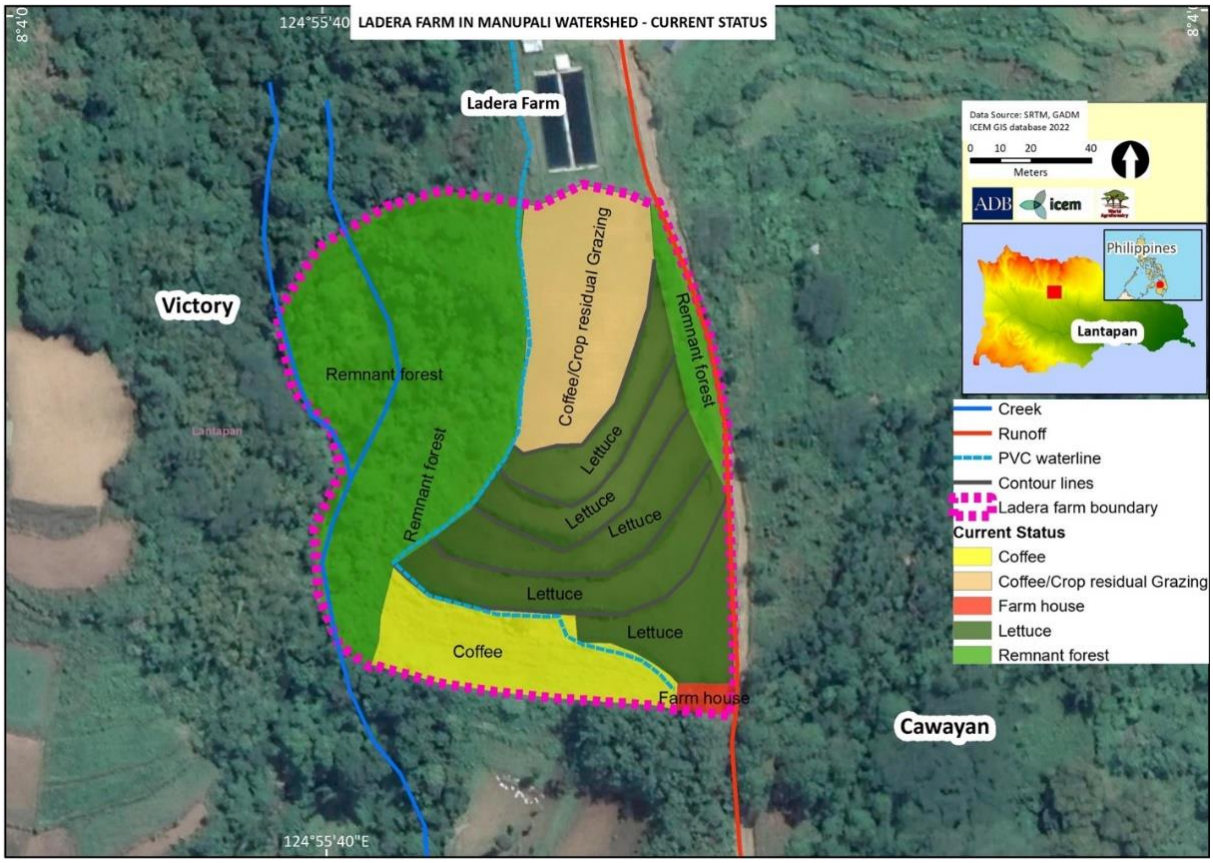
No.	Parameter	Indicator	Description
			• Some have other sources of income aside from farming
3	Institutional circumstance	Inherent resource endowment	Usufruct lands with Tax Declaration
4	Forest and Landscape Restoration scheme	Agroecological transformation pathway	Conservation farming with mixed-tree-based cropping system link to farm ecotourism
5	Appropriate incentive system for sustained participation	Driving motivation for sustained engagement	• Production subsidies • Discounted or free seedlings • Production loans at minimal interest • Crop insurance • Price and market security • Training
6	Climate change adaptation level	Level of resilience and adaptability to CC impacts	Medium adaptive capacity because farming household has more than one livelihood sources (off-farm) along with small family savings

4.3.2 Site Description

This farm is located in Brgy. Songco, Municipality of Lantapan, Province of Bukidnon. Songco is an upland village which partly occupies MKRNP. The Park was created by virtue of Republic Act 8978 in 2000. Similarly, it was declared as an ASEAN Heritage Park in 2009. The Park is home to 661 plant species belonging to 264 genera and 106 families (Amoroso *et. al*., 2011). It shelters 58 mammals including bats, squirrels, mice and rats, civets, deer, etc., all of which makes its mammal diversity higher than Mt. Apo's (Heaney *et. al*., 2006). In terms of importance, the Park is home to 92 threatened plant species, 82 rare plant species, 108 endemic plant, 50 economically important plant species, and 56 newly recorded plant species in the locality, and 20 newly recorded plant species in the Philippines (Amoroso *et al*., 2011). The critically endangered Philippine Eagle and the world's second largest flower, *Rafflesia schadenbergiana*, is also found in the Park (DENR-B+WISER, 2015). Other ecosystem services provided by the Park include its cultural services, being home to ethnic groups Talaandigs, Higaonon, and Bukidnon, provisioning services such as medicine, non-timber and timber forest products, and freshwater. For instance, it is water source for domestic, agricultural, industrial, and commercial uses in low-lying areas.

Currently, the farm has some hedgerows (natural vegetation strips) and planted to vegetables (Figure 39). In addition, there are some coffee and grazing areas in the upper portion of the farm. To the west of the farm, particularly on the steep slopes leading to the creek below, is remnant forest. The site has steep slopes and would require enhancement of the current hedgerows. Terracing could stabilize the upper portions of the farm, where the steeper slopes are located.

Figure 39: The current land use status of the demonstration site of the Ladera Farm in the Songco Lantapan, Bukidnon as of July 2022



Source: ICEM GIS Database 2021, Project team

View of the Ladera Farm showing the hedgerows and the steep slope that could accelerate soil loss

Source: Project team

This condition reveals the imperatives of enhancing the demo farm's soil and water conservation measures.

The view of the Ladera demo farm from the top portion

Source: Project team

Notice the steep slope. Additionally, the landscape shows remnant forests and plantation forests.

Steep slope at Ladera Farm

Source: Project team

The hedgerows also show the need for reinforcement to better control and prevent soil loss.

Remnant forest adjacent to the Ladera Farm

Source: Project team

The slope is steeper towards the creek below.

4.3.3 Goal of Restoration

The end goal of the Ladera Farm demonstration site is to demonstrate the restoration of ecological integrity and enhancement of human well-being towards the creation of climate-resilient ecosystems. The proposed interventions are geared towards achieving conservation and economic objectives through agroforestry and ecotourism approaches.

4.3.4 Objectives

As a privately owned farm lot, the Ladera demo farm will be an opportunity to showcase to other small-holder tree farmers an economically and ecologically sustainable farming system in the MKRNP. Specifically, the demonstration farm will:

- Conserve the remnant natural forests
- Protect the hydrological system in the MKRNP
- Develop a productive farm that could support ecotourism adventure in the MKRNP
- Enhance livelihoods of the forest community

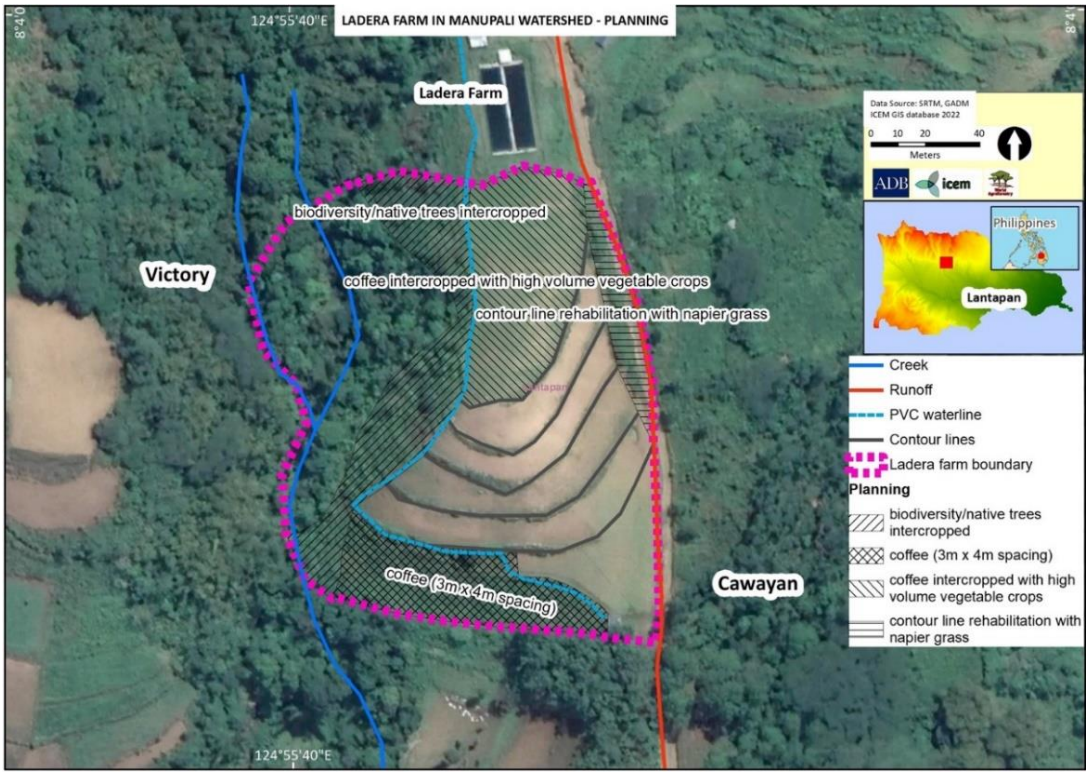
4.3.5 Actions

Based on the identified objectives of the demo farm the following actions are planned:

a) Accelerate restoration of native vegetation through enrichment planting in the farm and adjacent remnant natural forest.
b) Enhance soil and water conservation measures in the farm using double hedgerows of natural vegetative strip (NVS) and economically important fruits trees and crops
c) Introduction of commercially valuable timber crop trees
d) Crop rotation of high value vegetable crops
e) Gradual shift to complex tree-based agroforestry system

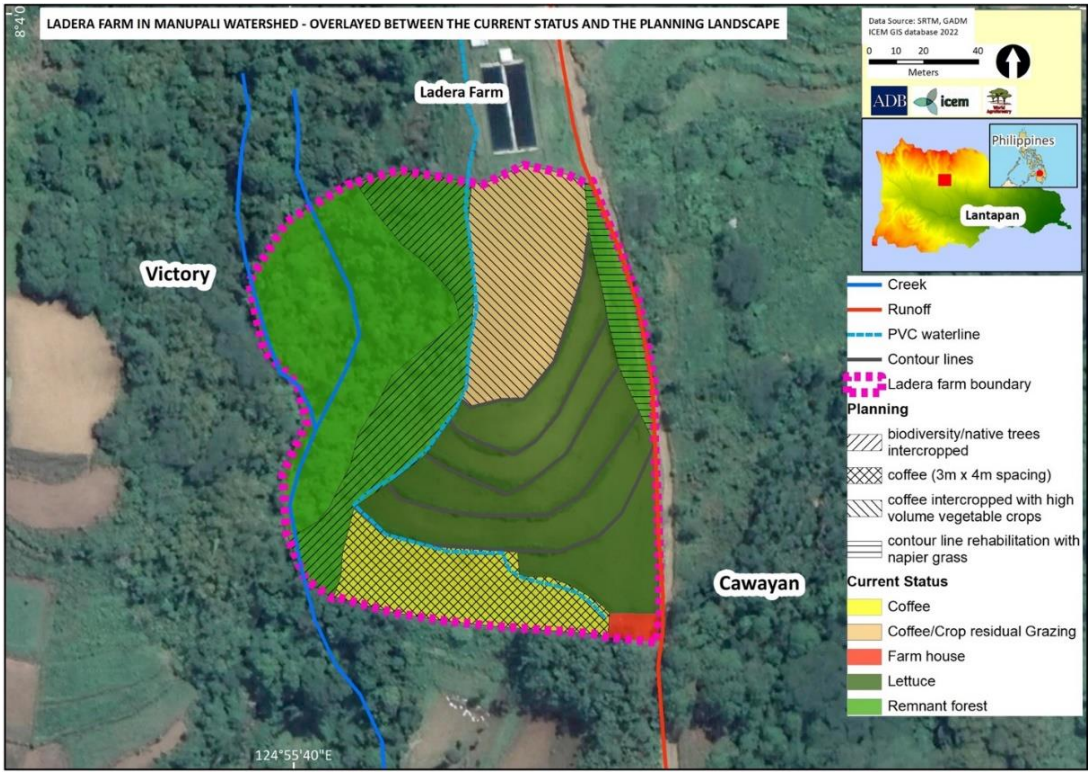
As of to date, three major consultations and discussions with the farmer have been conducted (July 2022, October 2022 and April 2023). These yielded restoration plans are described in this document. The initial plan was the output when a team of international and national experts met and discussed with the farmer the possible restoration pathway that his farm could take based on the current configuration (Figure 40 and Figure 41). Subsequently, the national team had another consultation with the farmer last October 2022 and recently in April 2023. In all these visits, the farmer appears to have new ideas and desires for his farm. The experience highlights the importance of a strong engagement and a very flexible restoration plan that will allow the farmer to reflect upon the plan and even consult/discuss with his family. The newest revisions will be described in the next section.

Figure 40: The planned land use status of the demonstration site of the Ladera Farm in the Songco Lantapan, Bukidnon based on the workshop held July 29, 2022



Source: ICEM GIS Database 2021, Project team

Figure 41: The combined land use (current and planned) of the Ladera Farm in the Songco Lantapan, Bukidnon based on the workshop held last July 29, 2022



Source: ICEM GIS Database 2021, Project team

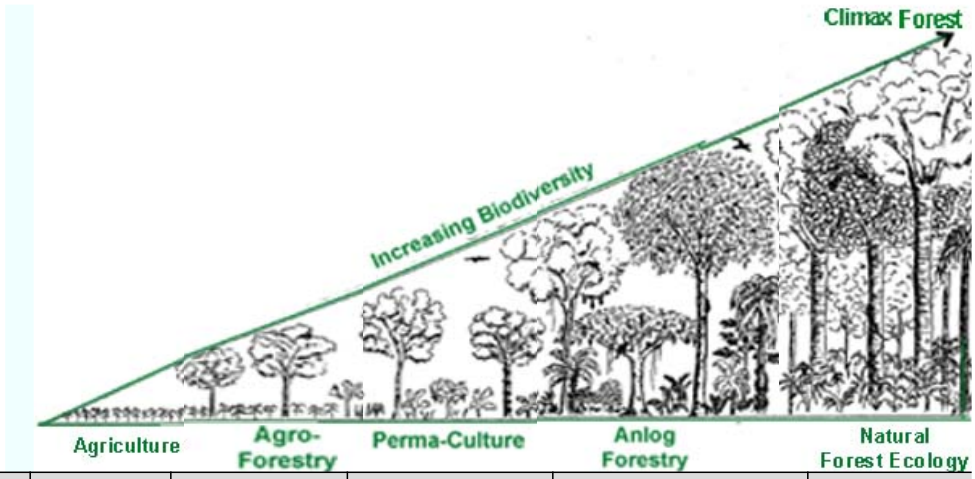
4.3.6 Phasing Approach

The plan is to cover the entire target site. However, resources available to the project are limited. The planned actions should be prioritized with the most important implemented first, and others left to later stages. This section sets out the proposed stages, assuming it will take time for the partners to attract additional resources to ensure the sustainability of the plan's implementation.

Table 12: Phasing of activities in the Ladera Farm

Sources of income	1-3 years	3-5 years	5 years +++
Short-term	Vegetables (tomato/ carrots/ lettuce) Rootcrops		
Medium-term		Coffee Jackfruit Avocado Rimas Kamansi	
Long-term			Benguet pine Musizi Eucalyptus Aquilaria Kalingag

Figure 42: Projected succession of vegetation in the Ladera Farm including the objectives of the farming operations



Evolution Period	0	3-5 years	5-20 years	20 + years	50 +years
Vegetation	Vegetables	Mixed	Tree-based	Native timber & fruit trees + perennial + rootcrops + NTFPs	Restoration of natural forest
Combinations	Tomato/ carrots/ lettuce	Pine+ jackfruit+ avocado+ coffee+ vegetables + rootcrops	Kalingag+ musizi+ eucalyptus+ pine+ jackfruit+ avocado+ rimas+ kamansi+ coffee+ NTFPs	Kalingag+ musizi+ eucalyptus+ pine+ jackfruit+ avocado+ rimas+ kamansi+ coffee+ NTFPs	Kalingag+ jackfruit+ avocado+ rimas+ kamansi+ coffee+ NTFPs
Function	Food+cash	Food+cash+SWC	Food+cash+ES	Food+cash+ES+ biodiversity	Food+cash+ES+ biodiversity

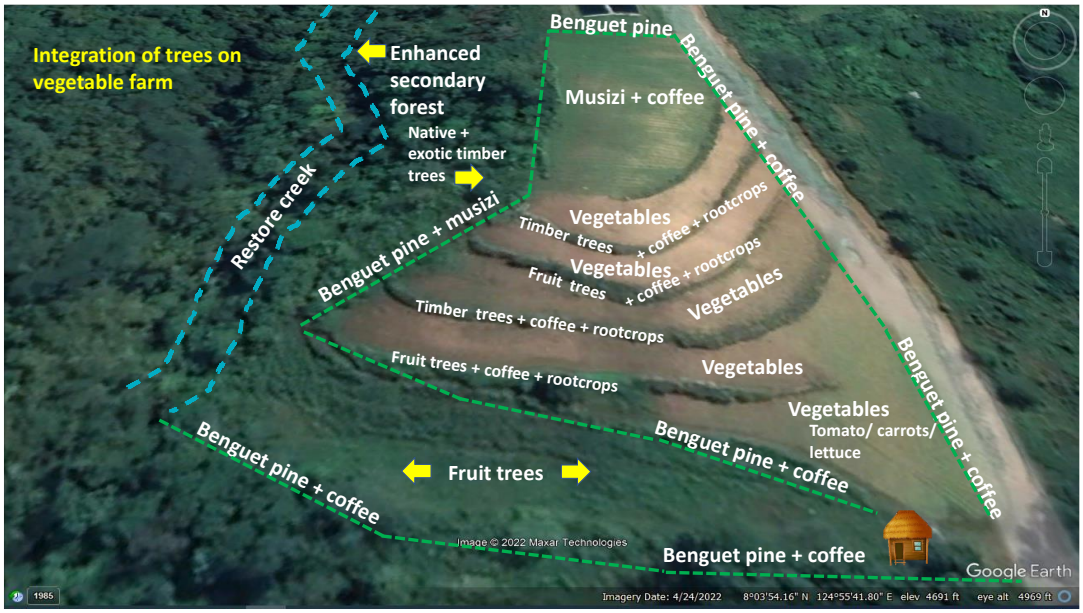
Source: Project team

II. Planting Guidance

4.3.7 Spatial Configuration

To date there had been three consultations and revisions of the demo farm plan with the farmers e (July and October 2022 and April 2023). These revisions and refinements reflect the participatory planning and engagement process employed by the project. Figure 43 shows the farm's spatial configuration based on the October 2022 farmer and team consultations and discussions. The hedgerows will be a complex NVS with crops and fruit trees.

Figure 43: Spatial configuration of the farmer and team consultation last October 2022



Source: ICEM GIS Database 2021, Project team

4.3.8 Species Allocation by Block

The tree component of the proposed complex tree-based agroforestry system is detailed in Figure 44, Table 13, Table 14, Table 15, and Table 16.

For the perimeter planting, several native tree species are proposed: Benguet pine, Lapnisan, kalingag, Philippine chestnut, almaciga, kalamagan and bagamanas. Pine trees although not native to the MKRNP, has shown to grow successfully in the Bukidnon province particularly in high elevations. The species produces excellent timber wood. It is spaced at 10 x 10 m. Besides the boundary planting, B. pine was also planted in the hedgerows. For the lapnisan (*Aquilaria malaccensis*), it is valuable tree native species that is currently classified as critically endangered by The International Union for Conservation of Nature (IUCN) Red List[4]. The species is highly sought for its economic value, but little efforts are underway to increase its planting, thus incorporating this in the demo farm would promote its adaption as a plantation species by smallholder tree farmers particularly in the MKRNP. It is proposed to be planted at a 3 x 3 m spacing with approximately 120 pieces. Additionally, kalingag (Mindanao cinnamon, *Cinnamomum mindanense* or *C. mercadoi*). It is useful as flavoring for foods, beverages; as a stomachic beverage, medicinal treatment for many ailments (nausea, flatulence, dyspepsia, coughs, diarrhea, gripe and malaria). The oil and oleoresin is used in soap and perfume manufacturing, a source of timber[5]. The Philippine chestnut (possibly *Lithocarpus mindanaensis*) is another native tree species growing in the MKRNP and according to the IUCN Red list is near threatened[6]. The tree species has not been widely domesticated, but similar to its chestnut relative,

[4] https://www.iucnredlist.org/search?query=Aquilaria%20malaccensiS&searchType=species
[5] (http://www.stuartxchange.org/Kami.html)
[6] (https://www.iucnredlist.org/species/138596343/138598500)

its potential as a fruit remains unexplored but promising. Accordingly, the fruit is eaten by wild boars. Another species that will be planted is Almaciga (*Agathis dammara* or *A. philippinensis*), which is classified as vulnerable[7]. The tree is an excellent timber tree, and its resin (Manila copal) is highly valued in manufacturing varnishes, lacquer, soap, paint, printing inks, linoleum, shoe polish, floor wax, plastic, waterproofing materials, paper sizing, and other products[8]. Its domestication has been very slow despite its enormous economic and ecological importance. Another native tree species found in MKRNP that will be planted is kalamagan (some call it white maple). The tree accordingly produces for its nectar that attracts bees. Passion fruit is also proposed to be planted. Some root crops are proposed to be planted, e.g. gabi, camote, and cassava. On the western boundary of the farm is a steep slope towards a small creek; enrichment planting with native trees is planned. In July 2023, some 200 rattan seedlings were planted at a 2 x 3 m spacing.

Figure 44: The spatial distribution of the different tree and crop species in the Ladera Farm

Source: Project team

Table 13: Details of the planting plan in the Ladera demo farm

Planting location (number of hedges)	Length (m)	Crop(s) to be planted	Spacing	Planting notes	Number of crops[a]	Source of planting stock	Cost (Php/ seedling)[b]
Hedges (5)	40 + 50 + 60 + 70 + 80 = **300**	*Kamansi* / breadnut	10m. Alternating between species of fruit trees	Select among fruit trees every 10m	30	Vards Estrada / purchase	75
		Rimas / breadfruit				Vards Estrada / purchase	75
		Avocado				BAFF / purchase	75
		Jackfruit				BAFF / purchase	75
		Cardava Banana				Tissue cultured / Davao de Oro	75

[7] (https://www.iucnredlist.org/species/202906/2757847)
[8](https://www.searca.org/news/ips-learn-sustainable-community-based-almaciga-resin-tapping#:~:text=It%20is%20highly%20valued%20for,paper%20sizing%2C%20and%20other%20products

Planting location (number of hedges)	Length (m)	Crop(s) to be planted	Spacing	Planting notes	Number of crops[a]	Source of planting stock	Cost (Php/ seedling)[b]
						– Barlaan / purchase	
		Gabi	1m	Along hedgerow	300	Local variety	10
		Camote	1m	1m above gabi	300	Local	10
		Cassava	1m	1m above camote	300	Local	10

[a] Excluding mortality allowance
[b] Including handling to planting site, excluding planting costs

Table 14: Details of the planting plan of the perimeter and forested area in the Ladera demo farm

Planting location	Length (m)	Crop(s) to be planted	Spacing	Planting notes	Number of crops[a]	Source of planting stock	Cost (Php/ seedling)[b]
Perimeter and previous forest area	60 + 100 + 80 + 100 = **340**	Benguet Pine Tree	3m x 3m	Preferred by farmer	115 minimum	BAFF / purchase	75
		Lapnisan / Aquilaria malasensis	3m x 3m	Philippine native trees	TBD	Bohol / purchase	250
		Kalingag / cinnamon	3m x 3m			Vards Estrada / purchase	75
		Philippine Chestnut	3m x 3m			Vards Estrada / purchase	75
		Almaciga	3m x 3m			Vards Estrada / purchase	75
		Kalamagan	3m x 3m			Local / wildlings	75
		Bagamanas	3m x 3m			Local / wildlings	75

[a] Excluding mortality allowance
[b] Including handling to planting site, excluding planting costs

To augment the farmer's income, high value crops (vegetables) will continue to be planted in the short-term period (Table 15). This will include carrots, broccoli, and lettuce. These will be raised from seeds and supplemented with chicken dung and organic nutrient supplement to boost growth.

Table 15: Details of the planting plan of the vegetable area in the Ladera demo farm

Planting location hedges)	Length (m)	Crop(s) to be planted	Spacing	Planting notes	Number of crops[a]	Source of planting stock	Cost (Php/ seedling)[b]
Vegetable area		Carrots		Seeds	1 quart		1500
				Chicken dung	100 sacks		150/sack
				Organic nutrient supplement	1 gal FPJ 1 gal FFJ 1 gal CalPhos 1 gal OHN 1 gal IMO		1000/gal = 5000

Planting location hedges)	Length (m)	Crop(s) to be planted	Spacing	Planting notes	Number of crops[a]	Source of planting stock	Cost (Php/ seedling)[b]
		Broccoli		Seeds	1 quart		1500
				Chicken dung	100 sacks		150/sack
				Organic nutrient supplement	1 gal FPJ 1 gal FFJ 1 gal CalPhos 1 gal OHN 1 gal IMO		1000/gal = 5000
		Lettuce		Seeds	1 quart		1500
				Chicken dung	100 sacks		150/sack
				Organic nutrient supplement	1 gal FPJ 1 gal FFJ 1 gal CalPhos 1 gal OHN 1 gal IMO		1000/gal = 5000

[a] Excluding mortality allowance

[b] Including handling to planting site, excluding planting costs

The fruit tree component of the agroforestry scheme is detailed in Table 16. These include breadnut, breadfruit, avocado, jackfruit and also abaca. All the fruit trees will be spaced at 8 x 8 m.

Table 16: Details of the planting plan of the fruit tree area in the Ladera Demo Farm

Planting location	Length (m)	Crop(s) to be planted	Spacing	Planting notes	Number of crops[a]	Source of planting stock	Cost (Php/ seedling)+
Fruit tree area	80 x 20 = 1600m^2	*Kamansi* / *b*readnut	8m x 8m		25	Vards Estrada / purchase	75
		Rimas / breadfruit				Vards Estrada / purchase	75
		Avocado				BAFF / purchase	75
		Jackfruit				BAFF / purchase	75
		Abaca	~2m	Fit 2 abaca per fruit tree space	50	Purchase	75

[a] Excluding mortality allowance

[b] Including handling to planting site, excluding planting costs

Source: Project team

Benguet pine seedlings planted in the hedgerows with cash crops/vegetable crops on April 13, 2023

Source: Project team

The diversity of tree and crop species that are planned to be planted in the Ladera Farm is expected to enrich biodiversity and contribute to the increase productivity eventually contributing to farmer's income. Likewise, resilience could be promoted to address the changing environment and markets.

4.3.9 Planting Stock Production and Procurement

Based on LFPI plan, the planting stocks will predominantly be obtained from existing nurseries, which are contacts of LFPI. Information about the species, source, and prices are indicated in Table 13 and Table 14. The project's time frame does not allow the establishment of new nurseries, including the time required to raise plantable stocks. However, the long-term plan will be to develop personal or community nurseries to support the expansion of the restoration works in the watershed.

Only healthy, sturdy, vigorously growing seedlings will be purchased and transported. Large planting stocks will be preferred to maximize survival and subsequent growth and development. When delivered, seedlings will be acclimatized to reduce the transport shock.

4.3.10 Establishment of the Demo Farm

Site preparation

Contour lining will be performed in the steep portions of the farm and devoted to crops. An improvised A-frame will be utilized for the purpose. This could be part of the training of parents and teachers to enhance their competence in sustainable upland farming.

Spot weeding will be conducted for spot plantings (e.g., trees and other seedlings). Weeds and vines will be removed to prevent unnecessary competition with the planted seedlings.

Staking/hole digging

Staking will only be made for trees to be planted, but none for the remaining crops identified to be planted in the demo farm. Depending on the size of the plastic bags/container, the hole should be dug wide and deep enough to facilitate the quick settling of the ball of earth of the containerized seedlings. This will be true for the NTFPs that were earlier described.

Planting

The seedlings could be hauled manually or through carabao-powered sleds or horses, which farmers use to haul inputs or produce to and from the farm. Care should be exercised so as not to injure or unduly stress the seedlings during transport. Planting will be carried out during the rainy season, which will last from June to December. However, the December planting might be limited only to the first week of that month to ensure that seedlings can establish well before the rains become limited.

Replanting

Mortalities after planting the trees will be assessed at least a month later. To ensure the planting plan is followed, seedling mortalities, especially of trees, should be immediately replaced within the planting season.

4.3.11 Maintenance of the Demo Farm

Weeding

Removal of unnecessary competition like those from entwining vines or other weeds should be checked as early as possible as these could hamper the growth and development of the planted seedlings.

Fertilization

When available, fertilizers will be applied to boost the growth of the crops and trees. Decomposed manure could be used as an alternative.

Irrigation

During drought periods (presumably this year, when a moderate El Niño is predicted), the farmer may use an overhead rotary sprinkler which provides water by gravity.

Pests and disease control

Pests or diseases in the crops or trees should be carefully observed and noted/recorded. This should be part of the monitoring and evaluation for the demo farms. Crop rotation and diversity of crops will be part of the integrated pest management scheme that the farmer will practice.

Other silvicultural practices

Other silvicultural treatments or practices, particularly protection, shall be ensured. This will include protection from stray animals or wildlife. In addition, the native trees for timber production, e.g. almaciga shall be pruned as long as the height of man allows. Likewise, when the density of the trees become a limiting factor for further growth, particularly diameter growth, thinning should be employed to promote increased growth particularly of the long-lived (late succession) native trees.

4.3.12 Monitoring and Evaluation

Monitoring of the demonstration farm will be done for two purposes. The first is to evaluate the progress of the learning site within the Project's duration, while the second is to measure ecosystem

changes and assess the effectiveness of the restoration actions at the farm level beyond the Project's duration. These will be done by the LFPI and Village Government, respectively. Appropriate training will be conducted to implement monitoring.

The learning farm's progress and livelihood monitoring form is presented in Annex 2, and will be used monthly within the project period. For monitoring ecosystem services beyond the project, the indicators of the ecosystem services will be identified in a participative manner with the villagers. The indicators of ecosystem changes should be easily measurable, relevant, and practical. The results and lessons will be communicated to all the local community members based on the project's communications plan. The success of shifting to a tree-based system hinges on generating information that manifests the economic and ecological superiority of the proposed schemes in the demo farm. This could be demonstrated through the robust data collection the demo farm can generate.

4.3.13 Institutional Arrangements

The legal status of Mr. Ladera's farm is that it is a usufruct area with tenurial classification as Alienable and Disposal (A&D) Land. In the absence of a Land Title, the farmer's only basis for continually cultivating the area is the yearly Tax Declaration he pays at the Lantapan Local Government Unit (LGU) Municipal Hall. In this case, there is no pressure on him to venture into a tree-based cropping system as a condition for his continuous vegetable cultivation on his farm. However, for him to adopt conservation farming and a tree-based cropping system, the prospect of agroforestry farm tourism may be a good incentive for him in the long run. Hence, there should be a close interagency partnership and collaboration, first, at the Lantapan LGU level, then the provincial and regional bodies, with tourism as the main banner program to trigger other community-based income-generating enterprises such as food processing, ecological camping with ecotourism and cultural tourism, construction of homestays and promoting the sites for conference venues, etc.

4.4. Restoration Plan for the Jamito 1 Demo Farm

I. The Demonstration Farm

The demonstration farm is designated as Jamito 1 Demonstration Farm located in Sitio Mapawa, Songco, Lantapan Bukidnon. It is a 17.5 ha land owned by the family of Eduardo Jamito, Jr. The site is family-owned land, but a portion was donated to serve as a school for tribal children, such as the Kayukayan Ta Siganlawan.

4.4.1 Farmer Socio-economic Status and Institutional Circumstance

A brief summary of the farmer's socioeconomic profile is shown in Table 17.

Table 17: Farmer socioeconomic profile

No.	Parameters	Indicators	Description/Characterization
1	**Socioeconomic Status**	a. Average Monthly Income	More than P20,000
		b. Land Holding (ha) and Tenure	More than 1 land holdings of sizes 2-5 hectares, mostly titled privately owned
		c. Income Source (s)	Diversified
		d. Capitalization Capacity	Out of pocket financial resource
2	**Farmer Category**	Typology: Cash Surplus	• Control the market and production inputs • Hire laborers to till their big farms to gain more profit • Lend money to poor farmers with high interest rate
3			• Owns vast tract of titled lands as inheritance from parents

No.	Parameters	Indicators	Description/Characterization
	Institutional Circumstance	Inherent Resource Endowment	• Out of his good heart, he donated a piece land where the Talaandig Tribal community set up a public elementary school. • Offered the surrounding adjacent area of the school for demonstration farm
4	**Forest and Landscape Restoration Scheme**	Agroecological Transformation Pathway	Agroforestry and tree-based farming system link to farm and cultural tourism
5	**Appropriate Incentive System**	Driving Motivation for Sustained Engagement	Provision of moral incentives through public recognition and award system in tax exemptions or discounts
6	**Climate Change Adaptation Level**	Level of Resilience and Adaptability to CC Impacts	High adaptive capacity because the farming household has diverse livelihood and income sources

In essence, Mr. Jamito has high resilience and adaptive capacity to cope with the adverse impacts of climate change, considering his stable socioeconomic condition as having a cash surplus with diverse income sources. His passion for environmental protection motivated him to donate a certain portion of his land as the site of the Talaandig Tribal Elementary School as well as offer the adjacent area as a demonstration site for agroecological farming system towards tree-based cropping for the school children, their parents and teachers. Such motivation to engage in forest and landscape restoration in the Alanid sub-watershed can be sustained by providing moral incentives through public recognition and award systems such as tax exemptions or discounts. The prospect of linking school farms to agroforestry and cultural tourism could be an added incentive for pursuing his vision.

4.4.2 Site Description

Sitio Mapawa, Songco, Lantapan, Bukidnon is an upland village partly occupying MKRNP. The Park was created under RA 8978 in 2000. Similarly, it was declared as an ASEAN Heritage Park in 2009. The Park is home to 661 plant species from 264 genera and 106 families (Amoroso *et. al*., 2011). It shelters 58 mammals, including bats, squirrels, mice and rats, civets, deer, etc., all of which combined makes its mammal diversity higher than Mt. Apo's (Heaney *et. al*., 2006). In terms of importance, the Park is home to 92 threatened plant species, 82 rare plant species, 108 endemic plant, 50 economically important plant species, and 56 newly recorded plant species in the locality, and 20 newly recorded plant species in the Philippines (Amoroso *et al*., 2011). The critically endangered Philippine Eagle and the world's second largest flower, *Rafflesia schadenbergiana*, is also found in the Park (DENR-B+WISER, 2015). Other ecosystem services provided by the Park include its cultural services, being home to ethnic groups Talaandigs, Higaonon, and Bukidnon, provisioning services such medicine, non-timber and timber forest products, and freshwater. For instance, it is a water source for domestic, agricultural, industrial, and commercial uses in low-lying areas.

Beyond the philanthropic gesture of donating a portion of their land, the owners aim to provide the needed education of the young *lumads* (Indigenous peoples) to provide them a better future while educating them about the environment, particularly sustainable upland farming. The demonstration farm is intended to provide this avenue for teachers, parents, and school pupils to be exposed to and immersed in a complex tree-based agroforestry restoration system.

The land use is a mixture of agricultural crop production (broccoli, cabbage, eggplant), fallow grassland, bamboo grove, and secondary forest. In addition, portions have been subjected to a previous government reforestation program where *Gmelina* trees were planted. Based on the observations of these remaining *Gmelina* trees, it is a clear example of a wrong species-site matching where the elevational limits of the species were exceeded.

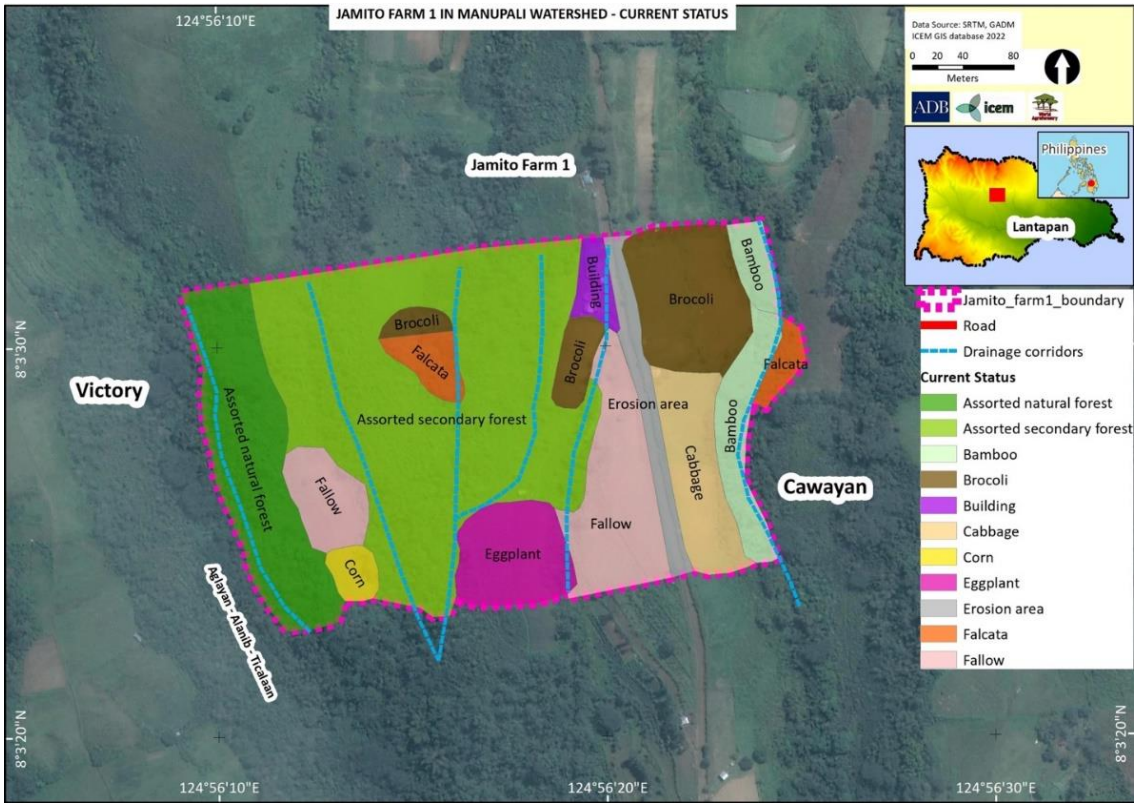
The remnant secondary forests are probably indications of the previous primary forest that dominated the area but has been subjected to logging, followed by farming and an increase in built-up areas propelled by many socio-economic factors. These issues pose immense challenges to any restoration work.

The grasslands' presence also indicates that the deterioration of the site conditions has resulted from years of unsustainable upland farming. There are also indications that the soil condition in the site is compacted. Accordingly, livestock was allowed to graze on the site, which could have contributed to the deterioration of the soil properties.

The Jamito Family has donated some of their property to construct a Tribal School. The school opens opportunities for children and parents to receive better environmental education.

Source: Project team

Figure 45: Current land use status of the Jamito 1 Farm based on the July 29, 2022 workshop



Source: ICEM GIS Database 2021, Project team

The fallow grassland area in the Jamito 1 Demo Farm. The grasses are also utilized as forage for the owner's livestock.

Source: Project team

A portion of the grassland area showing the bamboo grove.

Source: Project team

The remaining secondary forest in the Jamito 1 property. Below the steep slope is the Alanib River.

Source: Project team

Drone perspective of the secondary forest shows the remnant premium hardwood trees with small diameters, indicating that these were residual trees from the previous logging operations.

Source: Project team

Remnants of the Gmelina trees from the previous reforestation project. The Gmelina trees were planted beyond its optimum elevation limits, thus the poor performance

Source: Project team

4.4.3 Goal of Restoration

The end goal of the Jamito 1 demonstration site is the restoration of ecological integrity and enhancement of human well-being towards the creation of climate-resilient ecosystems through the partnership of a private landowner and the tribal community.

4.4.4 Objectives

Based on the aspirations of the farmer owner and the partner organization (Parents-Teachers Community Association (PTCA), the demonstration farm's objective is to establish a climate-resilient farm model that can enhance the farmer's productivity and restore ecological integrity.

a) Establish and develop an agroforestry cropping system to address the food security needs of the participants;
b) Assist the participants develop farming models for increasing productivity and income;
c) Empower the PTCA with skills to enhance their competencies in engaging in agroforestry, soil and water conservation and environmental management activities;
d) Establish farm models that can enhance farmer's productivity and restoration of ecological integrity.

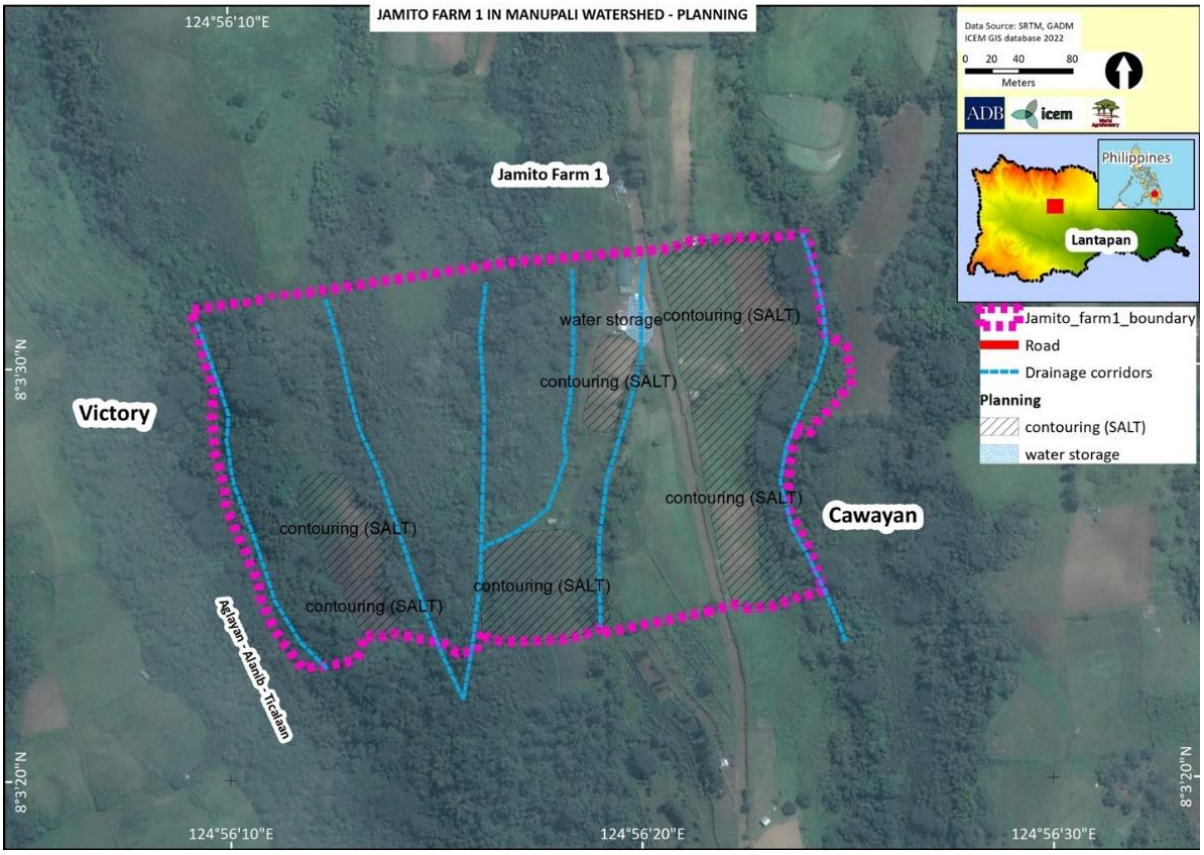
4.4.5 Actions

Based on the target objectives of the demo farm, the following actions are proposed: (a) planting of food crops pre-identified by LFPI and the PTCA; (b) incorporation of economically valuable crops (annual, perennial) including their wide ecological ability to withstand climate change threats and; (c) capability building programs to empower PTCA and school children in raising planting stocks of a wide variety of species (trees, crops, etc.) and designing tree-based agroforestry systems. In addition to crops and trees, various livestock could be incorporated into the farm when resources are available.

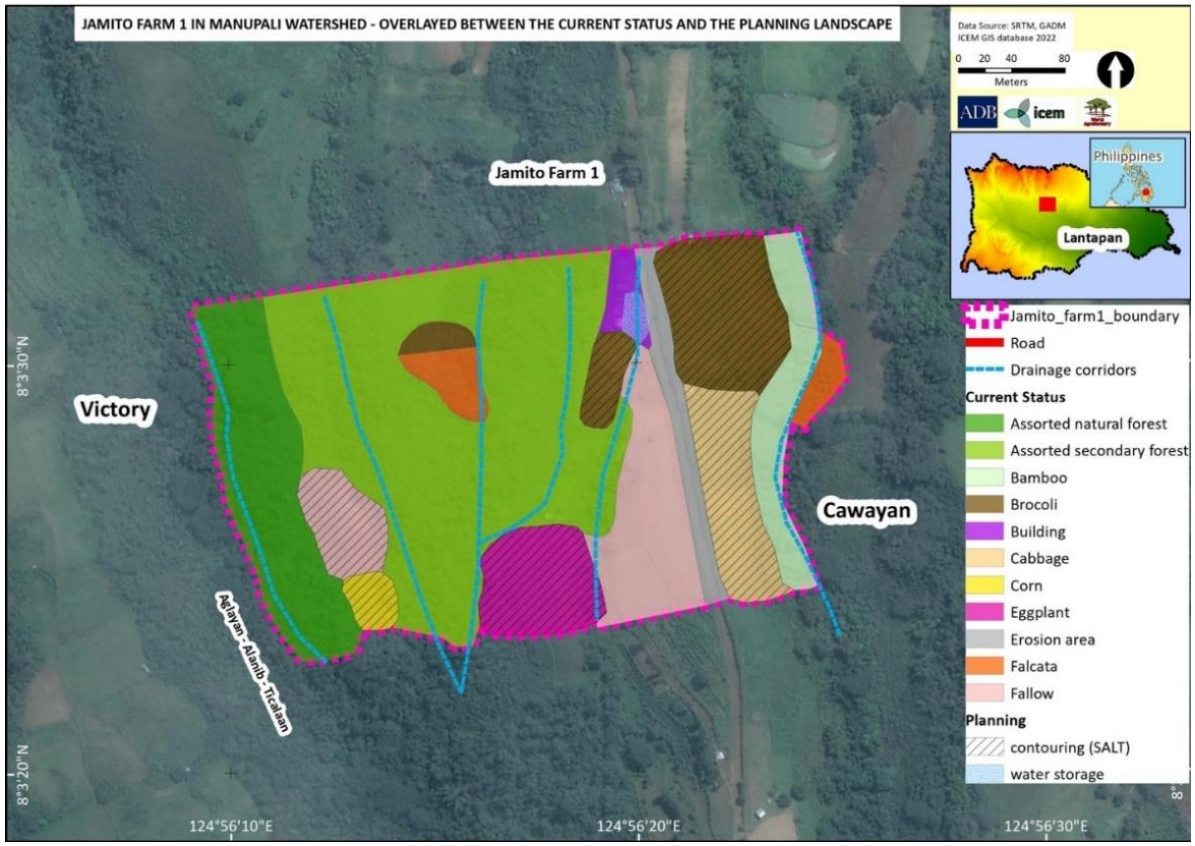
The preparation of the restoration plan involves participatory planning thus is evolving and has gone through three (3) iterative processes since July 2022 until the present date, but it is still expected to be slightly modified as the project proceeds. The initial participatory planning was conducted during the First International Field Mission; the output is shown in Figure 46. This version of the plan highlights the soil and water conservation feature, where hedgerows along contours will be employed for the steeper portions of the farm where crops are envisioned to be planted. Subsequently, another workshop with the farmer cooperator was conducted in October 2022. The output of said workshop is shown in Figure 47.

The second iteration of the participatory planning elicited more details regarding the diversity of crops to be planted. Several native tree species were identified and selected for planting, namely: Lapnisan (*Aquilaria*), Kalingag (Mindanao cinnamom), Kamansi, Philippine chestnut, almaciga, igem and ilang-ilang. This revision includes the fruit trees to be incorporated, namely coffee and cacao. There will be four rows of crops composed of the following: First row: Roots crops will be planted, namely camote, gabi/lutya, ube and cassava. Second row: High-value crops will be planted in the alleys including broccoli, cauliflower, cabbage, lettuce, and tomatoes. Third Row: Herbs and spices were also identified to be included, namely, medicinal herbs, lemongrass, onion, garlic, ginger, and turmeric. The third and fourth rows will also be planted in phases with medium-term crops: banana, coffee, cacao, abaca, avocado, jackfruit, and passion fruit. For long-term trees, the following will be considered: madre de agua and calliandra.

Figure 46: Planned developments in the Jamito 1 Demo Farm based on the participatory mapping exercise last July 29, 2022

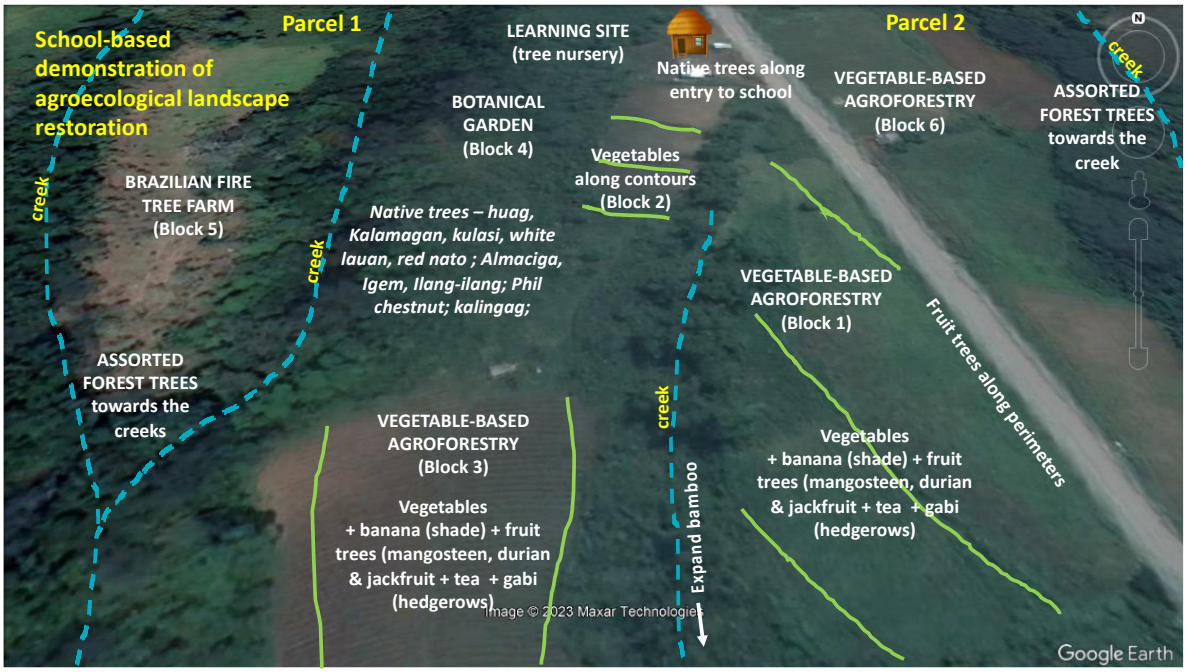


Source: ICEM GIS Database 2021, Project team



Source: ICEM GIS Database 2021, Project team

Figure 47: Proposed development interventions in the Jamito 1 Demo Farm based on the enhanced participatory mapping exercise last October 2022



Source: ICEM GIS Database 2021, Project team

4.4.6 Phasing Approach

The plan is to restore the entire target site. However, resources available to the current project are limited. Prioritization of components of the restoration plan is vital to schedule the site's development.

This section sets out the proposed stages, assuming it will take time for the partners to attract additional resources to ensure the sustainability of the plan's implementation.

The size of the farm necessitates the phasing of the farm development, thus, a short-, medium- and long-term plans for the farm will be described. The phasing approach in Jamito 1 and Jamito 2 demo farms are almost the same except that PTCA of the Tribal School will implement the Jamito 1 while that of Jamito 2 will be purely executed by the Jamito Family.

Agroforestry System (short-term Project Phase)

In the short-term rotation crops will be planted. A diverse choice of crops could be grown and produced on the demo farm. These may include food crops like camote, ube, gabi/lutya, banana, Aglag, or tomatoes. Alternatively, high-value vegetable crops like broccoli, chile, cabbage, lettuce or tomatoes could be cultivated. Spices like onions, ahos, luy-tad, and tanglad are also part of the possible list of species to be cultivated. During this phase, some hedgerows could be planted with coffee, cacao or matlu.

Livestock could also be introduced during this phase to increase the farmers' income and augment the food supply. Possible choices may include pigs, chicken, duck, goat, cow and carabao (water buffalo).

The planned diversity is an adaptation strategy to climate change and an augmentation scheme for the farm income, which the community could learn and benefit from. Farmers and their families are envisioned to move from subsistence farmers to surplus production for improved socio-economic status and resilience through this cropping system.

Agroforestry System (Medium-term 1-5 years)

In the medium term, the agroforestry system to be developed will include planting perennial fruit tree species like banana, coffee, cacao, abaca, avocado, jackfruit, and tea.

The gradual shift to perennial fruits aims to establish a more stable ground cover while providing a more reliable and regular source of food/fruit crops and/or income. The diversity introduced is intended to promote resilience to the changing climate and market forces.

Agroforestry System (Long-term 5-25 years)

The gradual shift to an improved agroforestry system and the phasing scheme is designed to deliberately improve the farmer's and his family's socio-economic status and to wean them away from subsistence farming to more sustainable farming systems. In the long term, the agroforestry system envisioned will be a more permanent native tree-based system, which employs long-lived late-succession tree species, e.g. katii, Mindanao cinnamon, *Aquilaria* (lapnisan), almaciga, huag/igem (*Podocarpus*)

Possible components and future for the demo farms were enumerated for the Jamito 1 and Jamito 2 sites. These include:

1. Arboretum of Native Trees
2. Assisted natural regeneration – Planting of native trees
3. Abaca production and processing
4. Coffee nursery establishment, parent plant selection, production and processing
5. Tea production and processing
6. Citronella production and processing
7. Cut flower production
8. Potato production and processing
9. Strawberry production and processing
10. Banana production and processing
11. Seedling Nursery
12. Clonal propagation and tissue culture laboratory

13. Livestock and livestock products (Swine, poultry, etc.) production and processing
14. Development of Mountain and River Resort
15. High value vegetable crops production and processing
    - Vacuum dryer
    - Blast freezer
    - Mist dryer
    - Other processing and storage solutions
16. Sugarcane, Muscovado processing
17. Root Crops production and processing
18. Bamboo production and processing
19. Others

The Mountain and River Resort development plan was also envisioned:

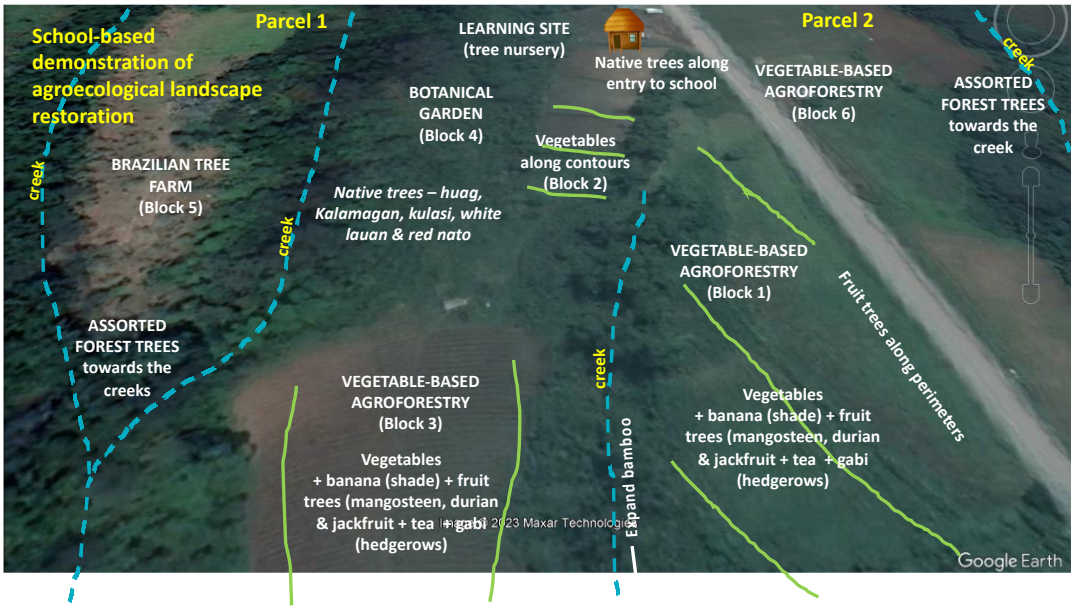
1. Training for Bamboo treatment and fundamental bamboo structures
2. Site development, road, and structural layout
3. Development and layout implementation
4. Investor and investment/Partnership Linkage
5. Concept presentation to potential partners
    - Partnership and management mechanisms
    - Organizational structure
    - resource and financial management
6. Identification and Inventory of existing resources of project site
    - Land area ~40has
    - Rivers, waterways, and water sources
    - Forest and biodiversity resources
    - Bamboo and other plants
    - Rocks and boulders
    - Partnerships with governmental organizations, Non-governmental organizations, and other agencies
    - Human resources
7. Resource conservation measures/showcase
    - Biodiversity conservation
    - Soil conservation
    - Water conservation
8. Livelihood creation and development
    - Soil bricks manufacturing
    - Weaving
    - Driftwood, furniture, and novelty items production
9. Skills training
    - Technical Education and Skills Development Authority (TESDA) and Department of Agriculture – Agricultural Training Institute (DA-ATI) programs access
    - DA-ATI Learning site for agriculture (LSA) Accreditation and Accreditation from other agencies

II. Planting Guidance

4.4.7 Spatial Configuration

The school-based demonstration of agroecological landscape restoration of the Jamito 1 farm is illustrated in Figure 48. The site is divided into six blocks: vegetable-based agroforestry blocks, the botanical garden block, and the Brazilian tree farm block. Assorted native forest trees will be planted in areas adjacent to the creek.

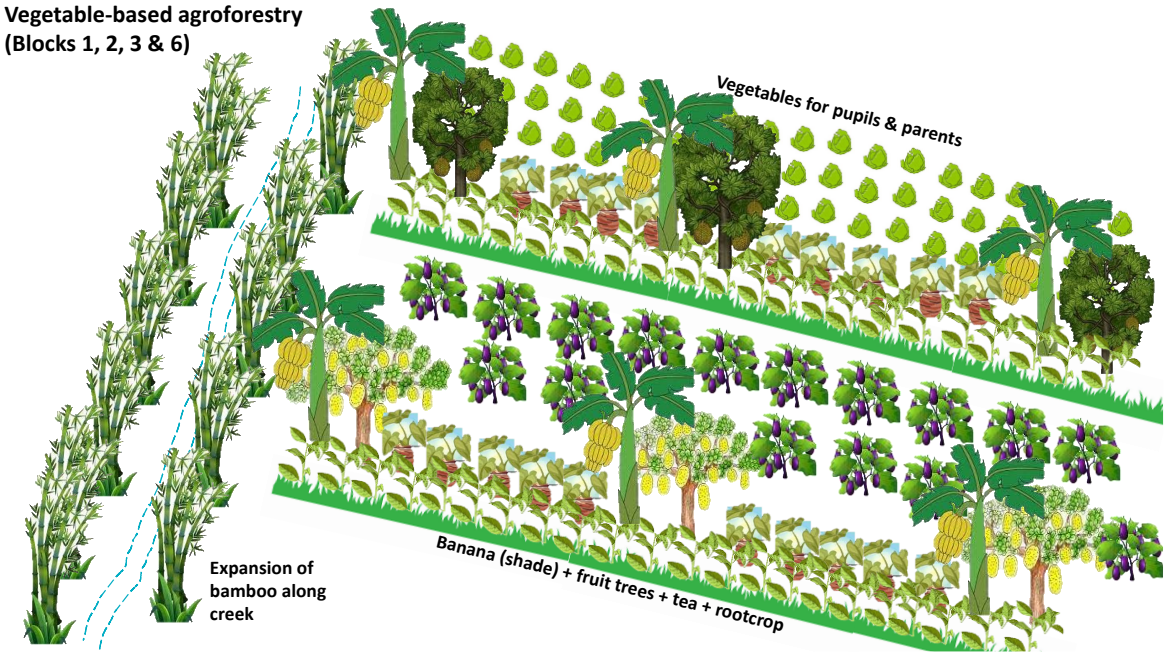
Figure 48: The proposed school-based demonstration of agroecological landscape restoration for the Jamito 1 farm showing the various blocks for development



Source: ICEM GIS Database 2021, Project team

The vegetable-based agroforestry system is illustrated in Figure 49. The planting scheme is the one proposed for the short-term scheme, which is a combination of food and cash crops targeting the food security objectives of the farmer and his family and improved socio-economic status. The scheme is intended to provide diversity in addressing food security, basic income, and resilience.

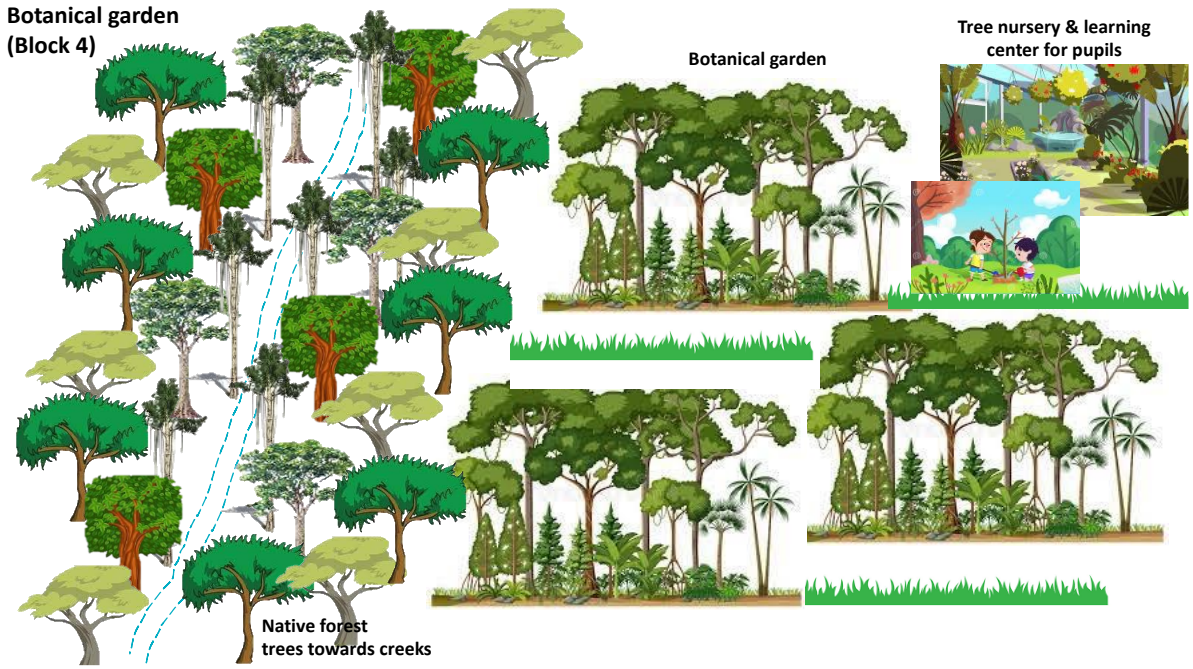
Figure 49: The vegetable-based agroforestry scheme in the Jamito 1 farm



Sources: ICEM GIS Database 2021, Project team

A botanical garden (Block 4, Figure 50) is proposed to teach the community and children about the various plants and trees native to the MKRNP. A proposed community nursery in the Botanical garden will be the source of the planting materials for the demo farm and even for the community farms that are envisioned to subsequently develop as a consequence of the demo farm.

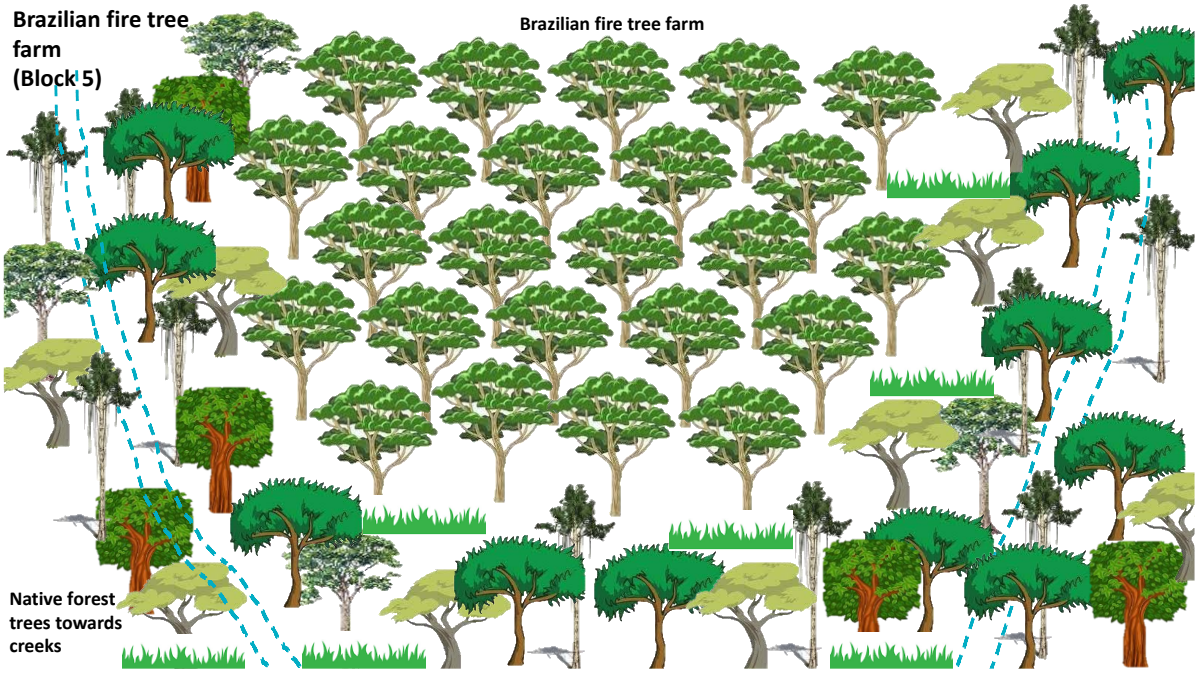
Figure 50: The Botanical Garden Block in the Jamito 1 Farm



Sources: ICEM GIS Database 2021, Project team

The Jamito 1 demo farm will also develop a tree farm to be planted with Brazilian fire trees. The fast-growing tree is a better alternative to falcata, which is more susceptible to gall rust at this elevation (Figure 51).

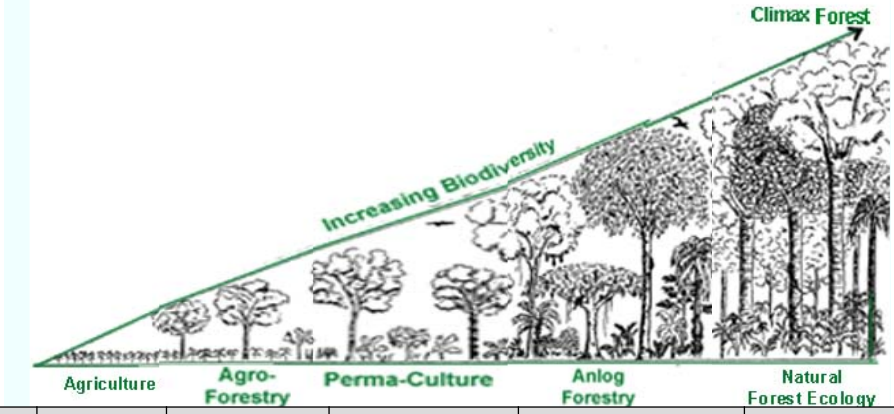
Figure 51: The Brazilian tree farm block in the Jamito 1 farm



Sources: ICEM GIS Database 2021, Project team

Eventually, an analog forest is targeted to develop in the long term as the farm is enriched with native forest trees and generates substantial income to wean the farmer away from dependence on subsistence farming, which mostly incentivizes short-rotation crops. This forest is considered almost akin to a primary forest and thus will be biodiverse in composition and generate multiple functions and benefits.

Figure 52: The Analogue Forest as the target reference forest of the Jamito 1 farm in the long-term



Evolution Period	0	3-5 years	5-20 years	20 + years	50 +years
Vegetation	Vegetables, fallow	Vegetable-based agroforestry	Vegetable-based AF & tree farm	Vegetable-based AF, tree farm & natural forest	Vegetable-based AF, tree farm & natural forest
Combinations	Cabbage/ eggplant, etc.	Fruits + banana + vegetables + tea + root crops	Fruits (durian, mangosteen, jackfruit) + banana + vegetables + tea + root crops Falcata	Fruits (durian, mangosteen, jackfruit) + banana + vegetables + tea + root crops Falcata Natural & food forest	Fruits (durian, mangosteen, jackfruit) + banana + vegetables + tea + root crops Falcata Natural & food forest
Function	Food+cash	Food+cash+SWC	Food+cash+SWC+ ecosystem services	Food+cash+SWC+ ecosystem services	Food+cash+SWC+ ecosystem services

Source: ICEM GIS Database 2021, Project team

4.4.8 Species Allocation by Blocks

The hedges of the Jamito farm will be planted to a number of species (Table 18). Double hedgerows of tea will be planted at a spacing of 1 x 1m. Coffee is a perennial tree planted in double rows above the tea at 2 x 2 m spacing. Several root crops will be planted in the hedgerows, namely gabi, camote, cassava, ube, all at 1 m spacing. Gabi will be along the hedgerows, camote 1 m above gabi, cassava 1 m above camote, and ube will alternate among rootcrops. Banana spaced at 10 m will be planted within the last coffee row, between the fruit trees. In addition, cacao will also be planted as a hedgerow at 10 m spacing, and abaca will be planted approximately 2 m, where two abaca plants will be fitted per fruit tree space. Katii will also be planted as a source of fuelwood, which is heavily demanded by the upland communities.

Table 18: Details of the hedgerow plantings in the Jamito 1 Demo Farm

Planting Location (number of hedges)	Length (m)	Crop(s) to be planted	Spacing	Planting Notes	Number of Crops (excl mortality allowance)	Source of Planting Stock	Cost (Php/seedling) (incl handling to planting site, excl planting cost)
Hedges (5)	25 + 30 + 35 + 45 + 60 = **195**	Tea	1m x 1m	Double row; within hedge	390	Cinchona Forest Reserve / Wildlings	10

Planting Location (number of hedges)	Length (m)	Crop(s) to be planted	Spacing	Planting Notes	Number of Crops (excl mortality allowance)	Source of Planting Stock	Cost (Php/seedling) (incl handling to planting site, excl planting cost)
		Coffee	2m x 2m	Double row; above tea	195	BAFF / Purchase	35
		Gabi	1m	Along hedgerow	195	Local Variety	10
		Camote	1m	1m Above gabi	195	Local	10
		Cassava	1m	1m Above camote	195	Local	10
		Ube	1m	Alternate among rootcrops	195	Local	10
		Banana	10m	Within last coffee row. Between fruit trees	20	Tissue Cultured / Davao de Oro – Barlaan / Purchase	75
		Cacao	10m		20	Purchase	75
		Abaca	~2m	Fit 2 abaca per fruit tree space	40	Purchase	75
		Katii for Firewood	1m		195	Local	10

Source: Project team

The planting details for the forested area are provided in Table 19. Lapnisan or *Aquilaria* will be planted as illustrated in Figure 50 and Figure 51. This species will be spaced at 3 x 3 m. Additionally, kalingag or Mindanao cinnamon will be similarly planted at a 3 x 3 m spacing. The same practice will be used for Philippine chestnuts, almaciga, kalamagan, and bagamanas.

Table 19: Details of the planting plan for the forested area in the Jamito 1 Demo Farm

Planting Location (number of hedges)	Length (m)	Crop(s) to be planted	Spacing	Planting Notes	Number of Crops (excl mortality allowance)	Source of Planting Stock	Cost (Php/seedling) (incl handling to planting site, excl planting cost)
Forested Area and Mother Plant Area		*Lapnisan / Aquilaria malasensis*	3m x 3m	Philippine Native Trees	100	Bohol / Purchase	250
		Kalingag / Cinnamon	3m x 3m		100	Vards Estrada/ Purchase	75
		Philippine Chestnut	3m x 3m		100	Vards Estrada / Purchase	75
		Alamaciga	3m x 3m		100	Vards Estrada / Purchase	75
		Kalamagan	3m x 3m		100	Local / Wildlings	75
		Bagamanas	3m x 3m		100	Local / Wildlings	75

Source: Project team

For the vegetable crops to be produced in the demo farm, the cropping pattern and practices are found in Table 20. Carrots will be produced from seeds utilizing chicken dung and organic nutrient supplements. Broccoli, lettuce and tomatoes will be propagated using seeds and fertilized with chicken dung and organic nutrient supplements. Herbs like onion, garlic, ginger, and lemongrass may also be incorporated in the farming system.

Table 20: Details of the planting plan for the vegetable area in the Jamito 1 Demo Farm

Planting Location (number of hedges)	Length (m)	Crop(s) to be planted	Spacing	Planting Notes	Number of Crops (excl mortality allowance)	Source of Planting Stock	Cost (Php/seedling) (incl handling to planting site, excl planting cost)
Vegetable Area (between hedgerows)		Carrots		Seeds	1 quart		1500
				Chicken Dung	100 sacks		150/sack
				Organic Nutrient Supplement	1 gal FPJ 1 gal FFJ 1 gal CalPhos 1 gal OHN 1 gal IMO		1000/gal = 5000
		Broccoli / Cauliflower		Seeds	1 quart		1500
				Chicken Dung	100 sacks		150/sack
				Organic Nutrient Supplement	1 gal FPJ 1 gal FFJ 1 gal CalPhos 1 gal OHN 1 gal IMO		1000/gal = 5000
		Lettuce / Tomato		Seeds	1 quart		1500
				Chicken Dung	100 sacks		150/sack
				Organic Nutrient Supplement	1 gal FPJ 1 gal FFJ 1 gal CalPhos 1 gal OHN 1 gal IMO		1000/gal = 5000
		Herbs and Spices		Onion Garlic Ginger Lemongrass		Local	

Source: Project team

The diversity of tree and crop species planned to be planted in the Jamito 1 Farm is expected to enrich biodiversity and increase productivity, eventually contributing to farmer's income. Likewise, resilience could be promoted to address the changing environment and markets.

4.4.9 Planting Stock Procurement/Production

Based on LFPI's plan, the planting stocks will predominantly be obtained from existing nurseries, which are part of the network of nurseries with which LFPI is in contact. Information about the species, source, and prices are indicated in Table 18, Table 19 and Table 20. The project's time frame does not allow the establishment of new nurseries, including the time required to raise plantable stocks.

However, the long-term plan will be to develop personal or community nurseries to support the upscaling restoration works in the watershed.

Only healthy, sturdy, vigorously growing seedlings will be purchased and transported. Large planting stocks will be preferred to maximize survival and subsequent growth and development. When delivered, seedlings will be acclimatized to reduce the transport shock and prepare them for eventual outplanting.

4.4.10 Demo Farm Establishment

Site preparation

Contour lining will be performed in the steep portions of the farm and devoted to crops. An improvised A-frame will be utilized for the purpose. This could be part of the training of parents and teachers to enhance their competence in sustainable upland farming.

Spot weeding will be conducted for spot plantings (e.g., trees and other seedlings). Weeds and vines will be removed to prevent unnecessary competition with the planted seedlings.

Staking/hole digging

Staking will only be made for trees to be planted, but none for the remaining crops identified to be planted in the demo farm. Depending on the size of the plastic bags/container, the hole should be dug wide and deep enough to facilitate the quick settling of the ball of earth of the containerized seedlings. This will be true for the NTFPs that were earlier described.

Planting

The seedlings could be hauled manually or through carabao-powered sleds or horses, which farmers use to haul inputs or produce to and from the farm. Care should be exercised so as not to injure or unduly stress the seedlings during transport. Planting will be carried out during the rainy season, which will last from June to December. However, the December planting might be limited only to the first week of that month to ensure that seedlings can establish well before the rains become limited.

Replanting

Mortalities after planting the trees will be assessed at least a month later. To ensure the planting plan is followed, seedling mortalities, especially of trees, should be immediately replaced within the planting season.

4.4.11 Demo Farm Maintenance

Weeding

Removal of unnecessary competitions like those from entwining vines or other weeds should be checked as early as possible as these could hamper the growth and development of the planted seedlings.

Fertilization

When available, fertilizers to boost the growth of the crops and trees will be applied. Organic fertilizers will be preferred over inorganic fertilizers. Decomposed manure could be used as an alternative.

Irrigation

During drought periods (presumably this year, when a moderate El Niño is predicted), the farmer may use an overhead rotary sprinkler, which provides water by gravity.

Pests/diseases

Pests or diseases in the crops or trees should be carefully observed and noted/recorded. This should be part of the monitoring and evaluation of the demo farms. Crop rotation and diversity of crops will be part of the integrated pest management scheme that the farmer will practice.

Other silvicultural treatments/practices

Other silvicultural treatments or practices, particularly protection, shall be ensured. This will include protection from stray animals or wildlife. In addition, the native trees for timber production, e.g., almaciga shall be pruned as long as the height of man allows. Likewise, when the density of the trees becomes a limiting factor for further growth, particularly diameter growth, thinning should be employed to promote increased growth, particularly in the long-lived (late succession) native trees.

4.4.12 Monitoring

Monitoring of the demonstration farm will be done for two purposes. The first is to evaluate the progress of the learning site within the Project's duration, while the second is to measure ecosystem changes and assess the effectiveness of the restoration actions at the farm level beyond the Project's duration. These will be done by the LFPI and Village Government, respectively. Appropriate training will be conducted to implement monitoring.

The learning farm's progress and livelihood monitoring form is presented in Annex 2, and will be used monthly within the project period. For monitoring ecosystem services beyond the project, the indicators of the ecosystem services will be identified in a participative manner with the villagers. The indicators of ecosystem changes should be easily measurable, relevant, and practical. The results and lessons will be communicated to all the local community members based on the project's communications plan. The success of shifting to a tree-based system hinges on generating information that manifests the economic and ecological superiority of the proposed schemes in the demo farm. This could be demonstrated through the robust data collection the demo farm can generate.

4.4.13 Institutional Arrangements

The legal status of Mr. Jamito's farm is a private titled area with secured tenurial status. In this case, he is not pressured to venture into a tree-based cropping system as a condition for his continuous engagement in vegetable farming. He even donated some land to establish the Talaandig Tribal Elementary School. However, for him to mainstream conservation farming and tree-based cropping system among the public-school children, teachers, and parents, the prospect of agroforestry farm tourism may be a good incentive for all of them in the long run. Hence, there should be a close interagency partnership and collaboration. First, at the Lantapan LGU level, the provincial and regional bodies will jump-start tourism as the main banner program. This is in the hope of triggering other community-based income-generating enterprises such as food processing, putting up homestays, transforming the site into conference venues, and ecological camping combined with eco and cultural tourism in the sites.

4.5. Restoration Plan for Jamito 2 Demo Farm

I. The Demonstration Farm

The demonstration farm is designated Jamito 2 Demonstration Farm in Sitio Cawayan, Songco, Lantapan Bukidnon. It is a land owned by the family of Eduardo Jamito Jr. The site is approximately 12 ha. The approximate location is: 8°2'45.85 North and 124°56'28.48 East with an elevation of approximately 1,123 m. The site is 390 m from the Aglayan-Alanib-Ticalaan Road, thus very accessible and highly visible to the public and other farmers.

4.5.1 Farmer Socio-economic Status and Institutional Circumstance

A summary of the farmer's socioeconomic profile is provided in Table 21. He has an average monthly income of over PHP20,000, classified as a cash surplus. He has a diversified income, which includes both on-farm and off-farm sources. He is categorized in the study as a cash surplus, characterized as

having the ability to control the market and production inputs, hire laborers to till large farms, and lend money to farmers with lower incomes at a high interest rate.

Mr. Jun's land was inherited from his parents, and he has donated part of it to the Talaandig Tribal community to be utilized for building a school. His interest in serving others drives his engagement in the demonstration of agroecological restoration. In terms of climate change adaptation, he has a very high capacity because of the varied household income sources and a very high adaptive capacity because farming households have diverse livelihoods and income sources.

Table 21: Farmer socioeconomic profile

No.	Parameters	Indicators	Description/Characterization
1	**Socioeconomic Status**	a. Average Monthly Income	More than P20,000
		b. Land Holding (ha) and Tenure	More than 1 land holdings of sizes 2-5 hectares, mostly titled privately owned
		c. Income Source (s)	Diversified
		d. Capitalization Capacity	Out of pocket financial resource
2	**Farmer Category**	Typology: Cash Surplus	• Control the market and production inputs • Hire laborers to till their big farms to gain more profit • Lend money to poor farmers with high interest rate
3	**Institutional Circumstance**	Inherent Resource Endowment	• Owns vast tract of titled lands as inheritance from parents • Out of his good heart, he donated a piece land where the Talaandig Tribal community set up a public elementary school. • Offered his vegetable farm and the adjacent brushland area for demonstration sites
4	**Forest and Landscape Restoration Scheme**	Agroecological Transformation Pathway	Agroforestry and Assisted Natural Regeneration link to farm and ecotourism
5	**Appropriate Incentive System**	Driving Motivation for Sustained Engagement	Provision of moral incentives through public recognition and award system in the form of tax exemptions or discounts
6	**Climate Change Adaptation Level**	Level of Resilience and Adaptability to CC Impacts	Very high adaptive capacity because the farming household has diverse livelihood and income sources

Source: Project team

In essence, Mr. Jamito has high resilience and adaptive capacity to cope with the adverse impacts of climate change, considering his stable socioeconomic condition as having a cash surplus with diverse income sources. His passion for environmental protection motivated him to convert his vegetable farm into a demonstration site for agroecological farming systems towards tree-based cropping alongside the Assisted Natural Regeneration scheme in his forest patch lot on the other side of the road. Such motivation to engage in forest and landscape restoration in the Alanib sub-watershed can be sustained by providing moral incentives through public recognition and award systems such as tax exemptions or discounts. The prospect of linking his farm to agroforestry and river ecotourism could be an added incentive for pursuing his vision.

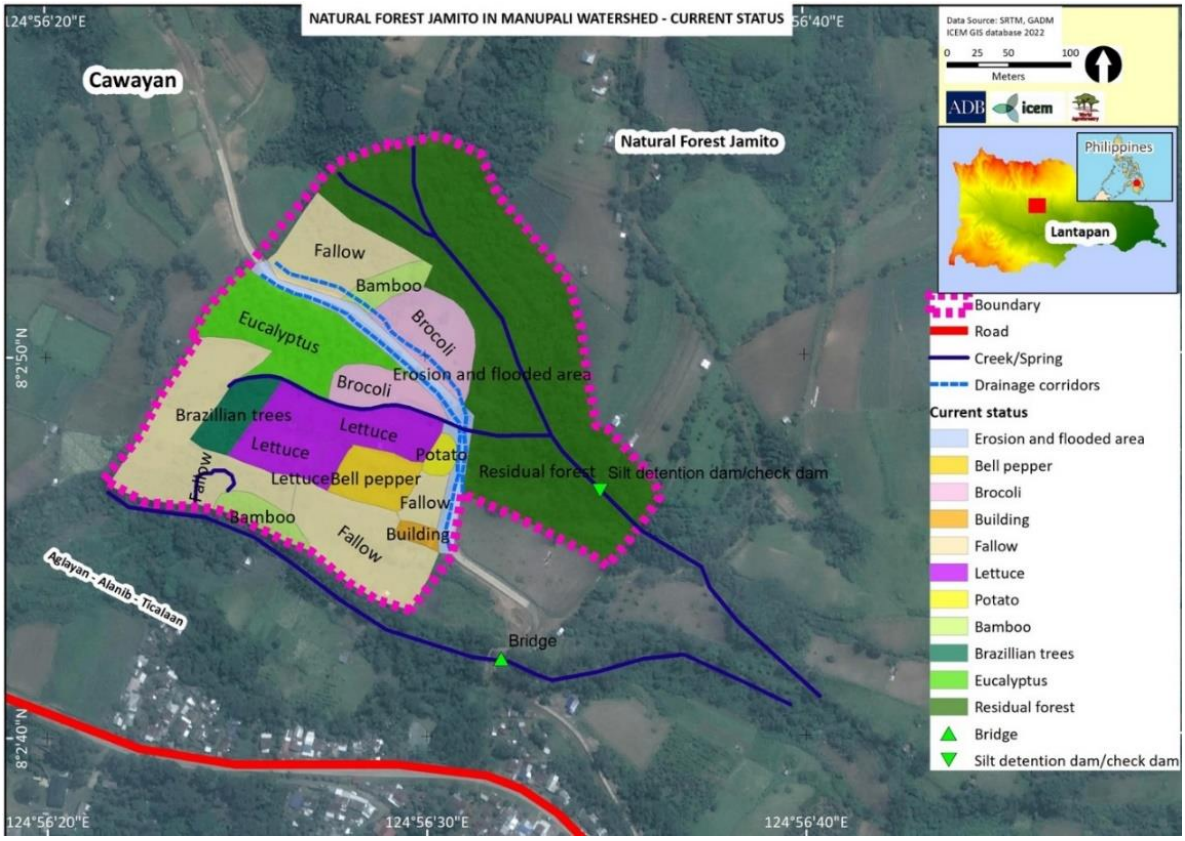
4.5.2 Site Description

Sitio Mapawa, Songco, Lantapan, Bukidnon is an upland village partly occupying MKRNP. The Park was created under RA 8978 in 2000. Similarly, it was declared as an ASEAN Heritage Park in 2009. The Park is home to 661 plant species from 264 genera and 106 families (Amoroso *et. al*., 2011). It shelters 58 mammals, including bats, squirrels, mice and rats, civets, deer, etc., which makes its mammal diversity

higher than Mt. Apo's (Heaney *et. al*., 2006). In terms of importance, the Park is home to 92 threatened plant species, 82 rare plant species, 108 endemic plants, 50 economically important plant species, and 56 newly recorded plant species in the locality, and 20 newly recorded plant species in the Philippines (Amoroso *et al*., 2011). The critically endangered Philippine Eagle and the world's second-largest flower, *Rafflesia schadenbergiana*, is also found in the Park (DENR-B+WISER, 2015). Other ecosystem services provided by the Park include its cultural services, being home to ethnic groups Talaandigs, Higaonon, and Bukidnon, provisioning services such as medicine, non-timber and timber forest products, and freshwater. For instance, it is the water source for domestic, agricultural, industrial, and commercial uses in low-lying areas.

The current land use of the farm is depicted in Figure 53. The site comprises the following land uses: vegetable crops like lettuce, potato, broccoli, and bell pepper. There are areas considered under fallow and plantations of Eucalyptus and Brazilian fire tree. The Alanib River is one of the farm's boundaries with bamboo groves, and the edge near the river is moderately steep. Across the village road that bisects the property is a remnant natural forest with a small creek where a previous soil erosion monitoring station was constructed. The topography is moderately rolling in this portion of the lot.

Figure 53: Current land use status of the Jamito 2 Demonstration Farm based on the participatory mapping July 2023



Source: ICEM GIS Database 2021, Project team

Portion of the Jamito 2 Demo Farm showing the current farming practices

Source: Project team

Current agricultural crops planted in the Jamito 2 Demo Farm

Source: Project team

Portion of the Alanib River that bounds the Jamito 2 Demo Farm, which is currently lined by a bamboo grove

Source: Project team

Soil erosion monitoring station located in the Jamito 2 Demo Farm

Source: Project team

4.5.3 Goal of Restoration

The Jamito 2 demonstration site aims to restore ecological integrity and enhance human well-being by creating climate-resilient ecosystems through a partnership with a private landowner.

4.5.4 Objectives

In general, the demo farm aims to demonstrate a farm model that can increase farmer's income and restore ecological integrity. Specifically, the farm will:

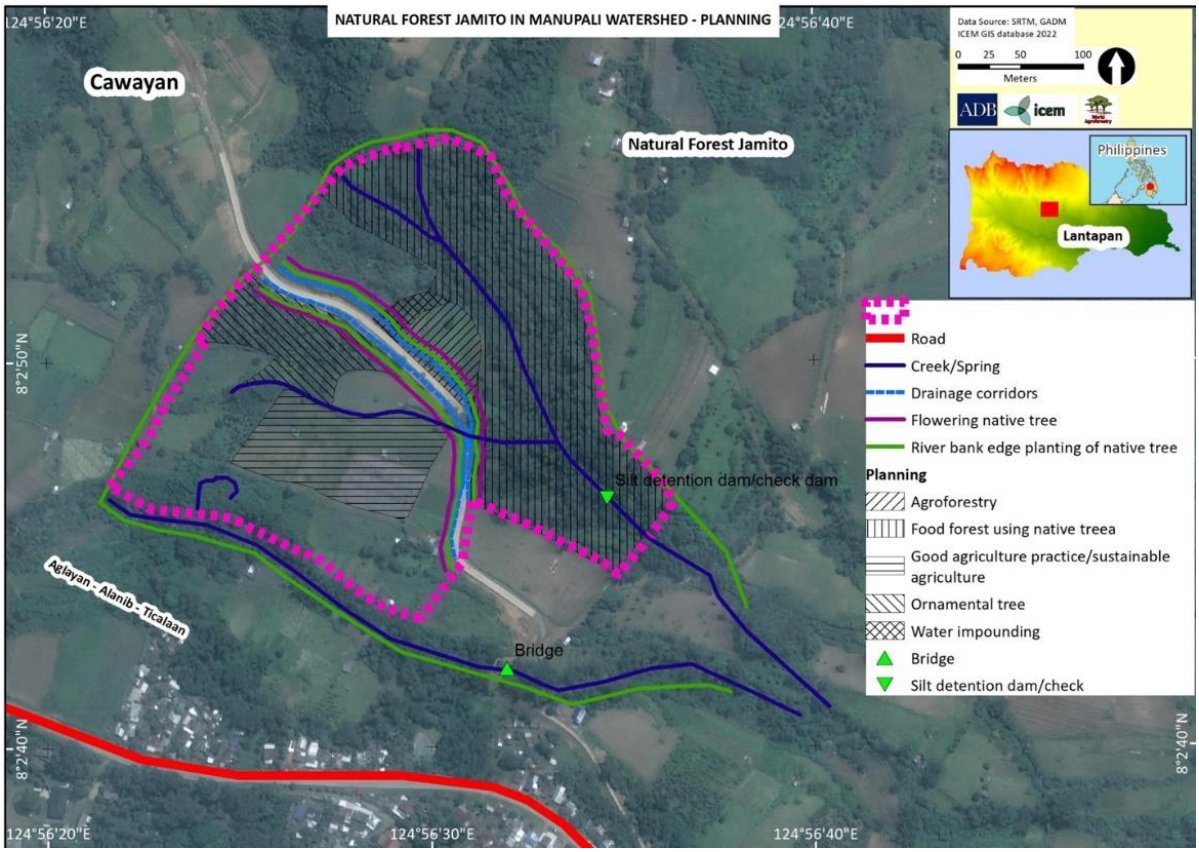
a) Establish cropping systems that could increase farmers' income.
b) Showcase complex tree-based agroforestry systems for increased income and enhanced conservation.
c) Demonstrate soil and water conservation practices that will protect adjacent drainage systems.
d) Develop a genetic resource conservation area for native trees of the MKRNP.

4.5.5 Actions

Agro-ecological approaches, particularly nature-based solutions, will be employed to achieve the objectives in the Jamito 2 demo farm. A participatory planning exercise was conducted with the landowner last July 2022, followed by another planning exercise in October of that year. The latest revisions were made in the April 2023 field visit. Various agroforestry schemes will be introduced, including planting high-value crops, root crops, and fruit trees.

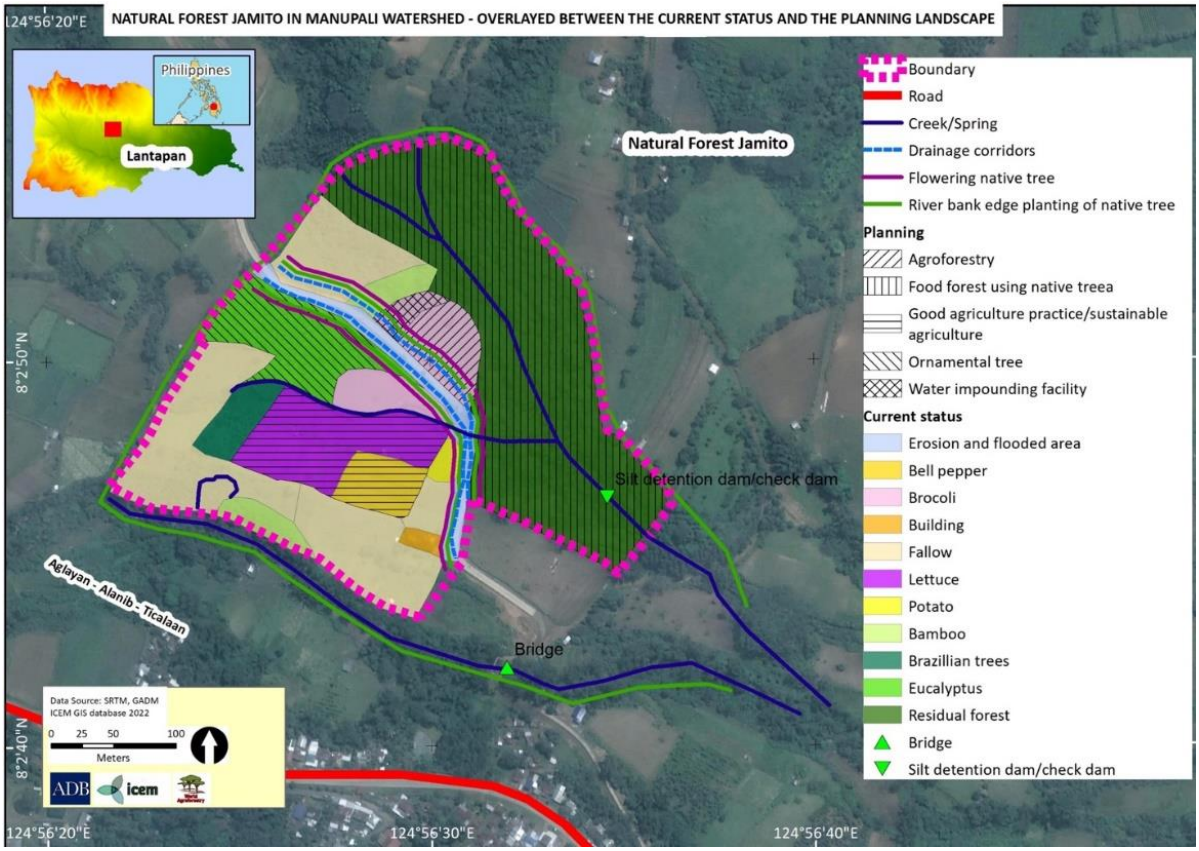
Similarly, native trees will be introduced to increase biodiversity while providing multiple benefits like food/fruits. Organic farming and crop diversity/rotation will also be introduced. Subsequently, a more refined version of the plan was produced after the farm planning's third iteration (Figure 101). In Parcel 1 of the lot, which is a relatively flat area, although there are steep portions, particularly that which borders the Alanib River, a tree-based agroforestry scheme is proposed. Hedgerows will be established along contour lines and laid out using an improvised A-frame. In Parcel 2, which is moderately rolling in terrain and has the remnant forest, a combination of tree planting of native trees, tea, abaca and assisted natural regeneration will be employed. In the same parcel (2), a genetic resources conservation area (GRCA) of native trees found in the MKRNP was also planned. The GRCA will be the potential source of planting materials, especially for the planned community nursery in Jamito 1 demo farm, and when restoration works using native trees will be upscaled.

Figure 54: The proposed land use change in the Jamito 2 Demo Farm based on the participatory mapping exercise (July 29, 2022)



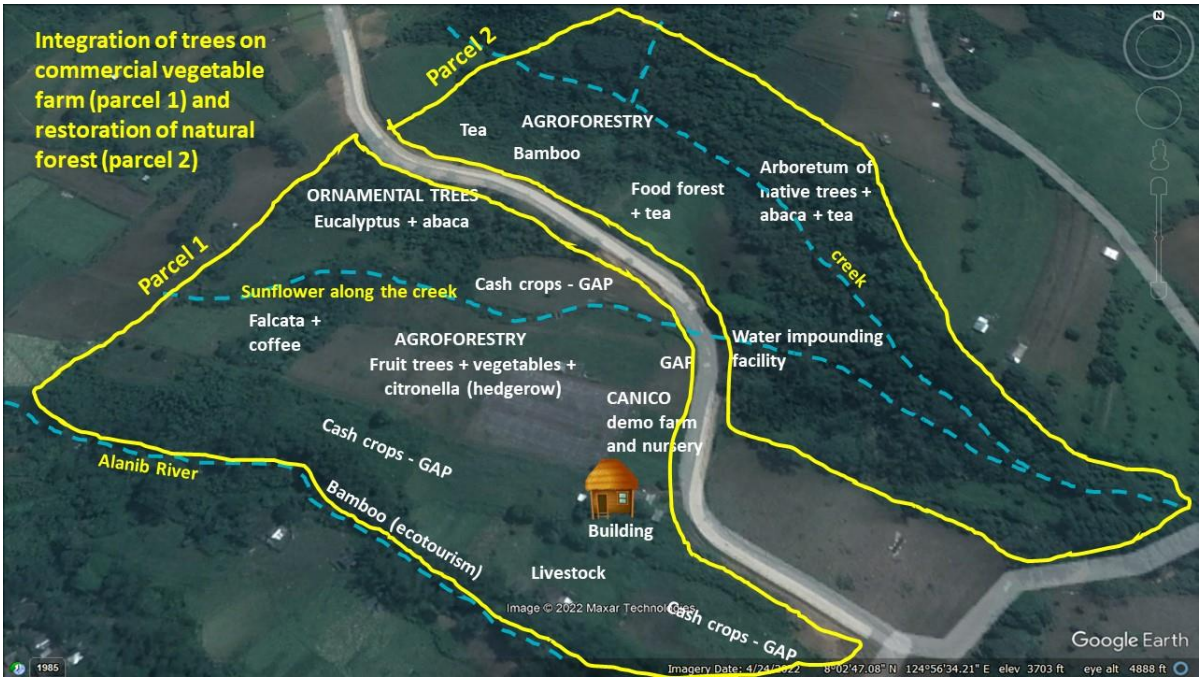
Source: ICEM GIS Database 2021, Project team

Figure 55: The combined current and future/planned land use in the Jamito 2 Demo Farm based on the participatory mapping exercise (July 29, 2022)



Source: ICEM GIS Database 2021, Project team

Figure 56: The output of the second iteration of the participatory planning in the Jamito 2 demo farm (October 2022)



Source: ICEM GIS Database 2021, Project team

4.5.6 Phasing Approach

The plan is to restore the entire target site. However, as resources available to the current project are limited, prioritizing components of the restoration plan is vital. This section sets out the proposed stages, assuming it will take time for the partners to attract additional resources to ensure the sustainability of the plan's implementation.

The size of the farm necessitates the phasing of the farm development, into short-, medium- and long-term plans. The phasing approach in Jamito 1 and Jamito 2 demo farms are almost the same, except that PTCA of the Tribal School will implement the Jamito 1 while the Jamito Family will purely execute that of Jamito 2.

Agroforestry System (short-term Project Phase)

Short-rotation crops will be planted and produced for the project's short-term phase. A diverse choice of crops could be grown and produced on the demo farm. These may include food crops like camote, ube, gabi/lutya, banana, Aglag, or tomatoes. Alternatively, high-value vegetable crops like broccoli, chile, cabbage, lettuce, or tomatoes could be cultivated. Spices like onions, ahos, luy-tad, and tanglad are also part of the possible list of species to be cultivated. During this phase, some hedgerows could be planted with coffee, cacao or matlu.

Livestock could also be introduced during this phase to increase the farmers' income and augment the food supply. Possible choices include pigs, chicken, duck, goat, cow, and carabao (water buffalo).

The planned diversity is an adaptation strategy to climate change and an augmentation scheme for the farm income, which the community could learn and benefit from. Farmers and their families are envisioned to move from subsistence farmers to surplus production for improved socio-economic status and resilience through this cropping system.

Agroforestry System (Medium-term 1-5 years)

For the medium term, the agroforestry system to be developed will include planting perennial fruit tree species like banana, coffee, cacao, abaca, avocado, jackfruit, and tea.

The gradual shift to perennial fruits aims to establish a more stable ground cover while providing a more reliable and regular source of food/fruit crops and/or income. The diversity introduced is intended to promote resilience to the changing climate and market forces.

Agroforestry System (Long-term 5-25 years)

The gradual shift to an improved agroforestry system and the phasing scheme is meant to deliberately improve the socio-economic status of the farmers and his families to wean them away from subsistence farming to more sustainable farming systems. In the long term, the agroforestry system envisioned will be a more permanent native tree-based system, which employs long-lived late-succession tree species, e.g. katii, Mindanao cinnamon, *Aquilaria* (lapnisan), almaciga, huag/igem (*Podocarpus*)

Possible components and future for the demo farms were enumerated for the Jamito 1 and Jamito 2 sites. These include:

1. Arboretum of Native Trees
2. Assisted natural regeneration – Planting of native trees
3. Abaca production and processing
4. Coffee nursery establishment, parent plant selection, production and processing
5. Tea production and processing
6. Citronella production and processing
7. Cut flower production
8. Potato production and processing
9. Strawberry production and processing
10. Banana production and processing

11. Seedling Nursery
12. Clonal propagation and tissue culture laboratory
13. Livestock and livestock products (Swine, poultry, etc.) production and processing
14. Development of Mountain and River Resort
15. High value vegetable crops production and processing
    - Vacuum dryer
    - Blast freezer
    - Mist dryer
    - Other processing and storage solutions
16. Sugarcane, Muscovado processing
17. Root Crops production and processing
18. Bamboo production and processing
19. Others

The Mountain and River Resort development plan was also envisioned:

1. Training for Bamboo treatment and fundamental bamboo structures
2. Site development, road, and structural layout
3. Development and layout implementation
4. Investor and investment/Partnership Linkage
5. Concept presentation to potential partners
    - Partnership and management mechanisms
    - Organizational structure
    - resource and financial management
6. Identification and Inventory of existing resources of project site
    - Land area ~40has
    - Rivers, waterways, and water sources
    - Forest and biodiversity resources
    - Bamboo and other plants
    - Rocks and boulders
    - Partnerships with GOs, NGOs, and other agencies
    - Human resources
7. Resource conservation measures/showcase
    - Biodiversity conservation
    - Soil conservation
8. Water conservation
9. Livelihood creation and development
    - Soil bricks manufacturing
    - Weaving
    - Driftwood, furniture, and novelty items production
10. Skills training
    - TESDA and DA-ATI programs access
    - DA-ATI LSA Accreditation and Accreditation from other agencies

II. Planting Guidance

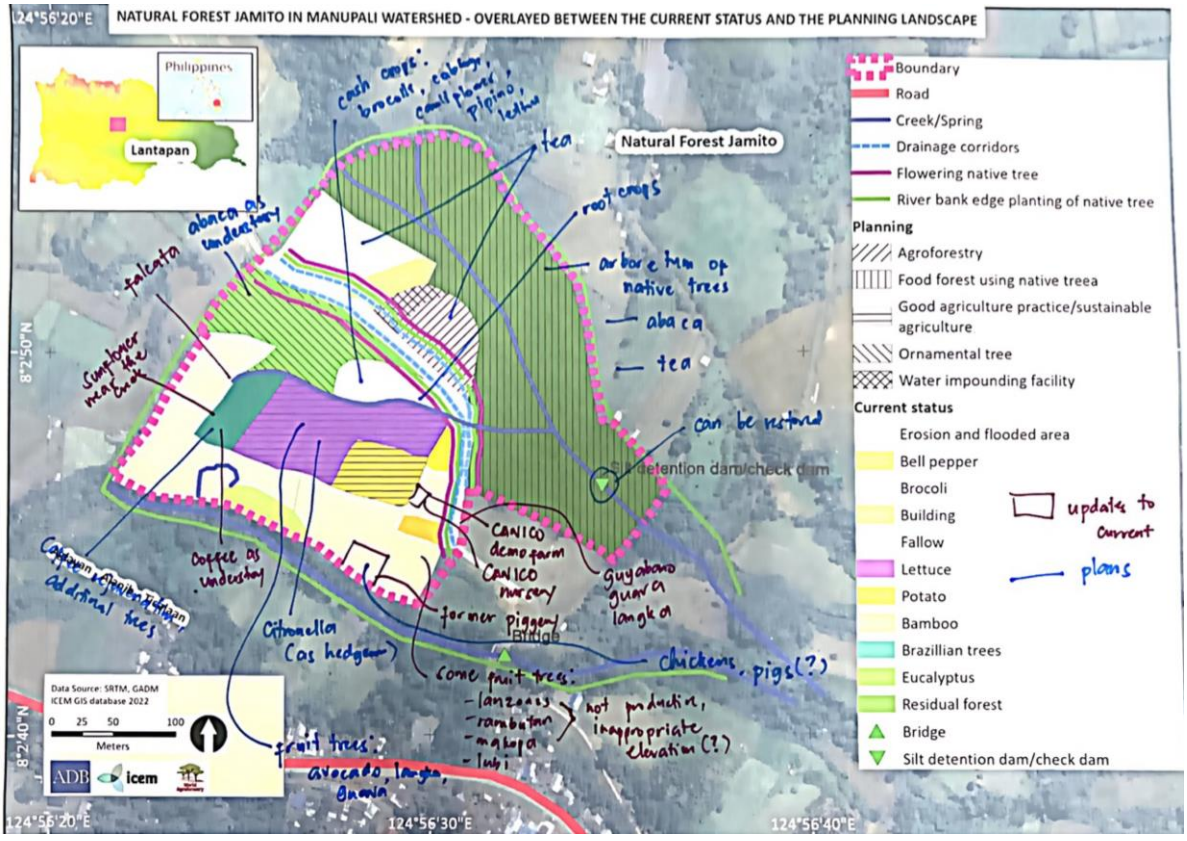
4.5.7 Spatial Configuration

The spatial configuration of the Jamito 2 farm is illustrated in Figure 57. The bamboo grove bordering the Alanib River will be enhanced for the planned ecotourism feature of the farm as it is very accessible. Adjacent to the bamboo group will be the planting of cash crops, one of which would be strawberries, which could be an ecotourism attraction in the area, considering that the elevation is high enough for a small strawberry farm. The Jamitos have already constructed a strawberry seedling

nursery in preparation for planting on the demo farm. An agroforestry section in the middle of Parcel 1 will be established. Citronella grass will be used as hedgerows, considering its value for essential oil. Essential oil could be another product that can increase the farmer's income. Inside this agroforestry section will be fruit trees like avocado, jackfruit, and banana. Other fruit trees have been planted in the farm (durian, coffee, and mangosteen). In addition to enhancing biodiversity, the additional products can likewise increase the farmer's income. Adjoining this agroforestry section will be a coffee plantation where old coffee trees will be rejuvenated while enrichment planting of new coffee seedlings will be made in empty slots. Sunflower is planned to be planted near the creek. This could provide additional soil and water conservation measures in addition to its attractive flowers for potential tourists. Also adjacent to the agroforestry section will be a proposed Brazilian fire tree plantation. The species is the alternative that farmers in these high-elevation ecosystems resort to instead of the popular falcata tree common in the lowlands, which is susceptible to gall rust at this high altitude. Abaca is considered an understory plant in this Brazilian fire tree plantation. With the increase in biodiversity, additional income is also expected. The CANICO demo farm/nursery will be maintained in its current location. In that portion of the lot near the road, high-value cash crops, cabbage, cauliflower, cucumber, and lettuce will be planted on a rotational basis. Adjacent to this section will be areas to be planted to root crops.

Parcel 2, across the road that bisects the property, is characterized by relatively rolling terrain in which native trees could be planted. Enrichment planting with red nato, white lauan, and yakal saplungan were planted during the fifth field mission. In addition, tea trees will also be planted in this parcel together with abaca as an understory plant. Again, enhancing biodiversity and increasing farm income is expected.

Figure 57: Proposed development interventions in the Jamito 2 Demo Farm based on the participatory mapping exercise (October 2022)



Source: ICEM GIS Database 2021, Project team

Dr. Paul Pasicolan inside the strawberry seedling nursery that the Jamito family established in the Jamito 2 demo farm

Fruit trees were planted on the Jamito 2 farm. These include durian, mangosteen, and coffee.

Source: Project team

Enrichment planting (April 14, 2023) during the fifth field mission. From left to right, Mr. Jun Jamito (the farmer owner); Dr. Paul Pasicolan, Dr. Orly Balderama (national experts), and For. Christian Libang (RBCO representative).

Source: Project team

4.5.8 Species Allocation by Block

The species to be planted in the demo farm are detailed in Table 22, Table 23 and Table 24, respectively, for native trees, vegetables, and fruit/other perennial trees.

Table 22: Details of the planting plan of forest area and boundaries in the JAMITO 2 Demo Farm

Planting Location (number of hedges)	Length (m)	Crop(s) to be planted	Spacing	Planting Notes	Number of Crops (excl mortality allowance)	Source of Planting Stock	Cost (Php/ seedling) (incl handling to planting site, excl planting cost)
Forested Area and boundary Perimeter		*Lapnisan / Aquilaria malasensis*	3m x 3m	Philippine Native Trees	100	Bohol / Purchase	250
		Kalingag / Cinnamon	3m x 3m		100		75
		Philippine Chestnut	3m x 3m		100	Vards Estrada / Purchase	75
		Alamaciga	3m x 3m		100	Vards Estrada / Purchase	75
		Kalamagan	3m x 3m		100	Local / Wildlings	75
		Bagamanas	3m x 3m		100	Local / Wildlings	75
		Other Native Trees	3m x 3m				

Source: Project team

As a private land, the continue planting cash crops/vegetables is expected in the Jamito 2 demo farm. The crops will be rotated include the following: carrots, broccoli, cauliflower, lettuce, and tomato. In addition, herbs and spices are planned to be added, namely onion, garlic, ginger, lemongrass, and

citronella (Table 23). The vegetables will be propagated using seeds and treated later with chicken dung and organic nutrient supplements to promote better growth and development.

Table 23: Details of the planting plan of the vegetable area in the Jamito 2 Demo Farm

Planting Location (number of hedges)	Length (m)	Crop(s) to be planted	Spacing	Planting Notes	Number of Crops (excl mortality allowance)	Source of Planting Stock	Cost (Php/seedling) (incl handling to planting site, excl planting cost)
Vegetable Area		Carrots		Seeds	1 quart		1500
				Chicken Dung	100 sacks		150/sack
				Organic Nutrient Supplement	1 gal FPJ 1 gal FFJ 1 gal CalPhos 1 gal OHN 1 gal IMO		1000/gal = 5000
		Broccoli / Cauliflower		Seeds	1 quart		1500
				Chicken Dung	100 sacks		150/sack
				Organic Nutrient Supplement	1 gal FPJ 1 gal FFJ 1 gal CalPhos 1 gal OHN 1 gal IMO		1000/gal = 5000
		Lettuce / Tomato		Seeds	1 quart		1500
				Chicken Dung	100 sacks		150/sack
				Organic Nutrient Supplement	1 gal FPJ 1 gal FFJ 1 gal CalPhos 1 gal OHN 1 gal IMO		1000/gal = 5000
		Herbs and Spices		Onion Garlic Ginger Lemongrass Citronella		Local	

Source: Project team

Other crops that will enrich the demo farm are listed in Table 24. These include the tea tree Coffee will likewise be planted in double rows above the tea rows. Banana will be added within the last coffee row and between the fruit trees at 10 m spacing. To enrich the biodiversity and diversify income as well, other fruit trees will be introduced, namely: breadnut, breadfruit, avocado and jackfruit. These will be spaced at 10 m and alternately planted along the coffee row.

Table 24: Details of the planting plan in the plantation area in the Jamito 2 Demo Farm

Planting Location (number of hedges)	Length (m)	Crop(s) to be planted	Spacing	Planting Notes	Number of Crops (excl mortality allowance)	Source of Planting Stock	Cost (Php/seedling) (incl handling to planting site, excl planting cost)
Plantation Area	TBD / Best	Tea	1m x 1m	Double row;	400	Cinchona Forest	10

Planting Location (number of hedges)	Length (m)	Crop(s) to be planted	Spacing	Planting Notes	Number of Crops (excl mortality allowance)	Source of Planting Stock	Cost (Php/seedling) (incl handling to planting site, excl planting cost)
	Estimate for Starting Plot			within hedge		Reserve / Wildlings	
		Coffee	2m x 2m	Double row; above tea	200	BAFF / Purchase	35
		Banana	10m	Within last coffee row. Between fruit trees	20		
		Kamansi / Breadnut	10m. Alternating between species of fruit trees	Select among fruit trees every 10m, along coffee row	20	Vards Estrada / Purchase	150
		Rimas / Breadfruit				Vards Estrada / Purchase	250
		Avocado				BAFF / Purchase	75
		Jackfruit				BAFF / Purchase	75

Source: Project team

The diversity of tree and crop species planned to be planted in the Jamito 2 Farm is expected to enrich biodiversity and increase productivity, eventually contributing to farmer's income. Likewise, resilience could be promoted to address the changing environment and markets.

4.5.9 Planting Stock Production and Procurement

Based on LFPI plan, the planting stocks will predominantly be obtained from existing nurseries that are contacts of LFPI. Information about the species, source, and prices are indicated in Table 22, Table 23 and Table 24. The project's time frame does not allow the establishment of new nurseries, including the time required to raise plantable stocks. However, the long-term plan will be to develop personal or community nurseries to support the expansion of the restoration works in the watershed.

Only healthy, sturdy, vigorously growing seedlings will be purchased and transported. Large planting stocks will be preferred to maximize survival and subsequent growth and development. When delivered, seedlings will be acclimatized to reduce the transport shock.

4.5.10 Establishment of the Demo Farm

Site preparation

Contour lining will be performed in the portions of the steep farm and devoted to crops. An improvised A-frame will be utilized for the purpose. Spot weeding will be conducted for spot plantings (e.g. trees and other seedlings). Weeds and vines will be removed to prevent unnecessary competition with the planted seedlings.

Staking and hole-digging

Staking will only be made for trees to be planted, but none for the remaining crops identified to be planted in the demo farm. Depending on the size of the plastic bags/container, the hole should be dug

wide and deep enough to facilitate the quick settling of the ball of earth of the containerized seedlings. This will be true for the NTFPs that were earlier described.

Planting

The seedlings could be hauled manually (volunteers, e.g., students on field practice, others) or through carabao-powered sleds or horses, which are the means farmers use to haul inputs or produce to and from the farm. Care should be exercised so as not to injure or unduly stress the seedlings during transport.

Replanting

Mortalities after planting the trees will be assessed a month later. To ensure that the planting plan is followed, seedling mortalities, especially of trees, should be immediately replaced within the planting season.

4.5.11 Maintenance of the Demo Farm

Weeding

Removal of unnecessary competitions like those from entwining vines or other weeds should be checked as early as possible as these could hamper the growth and development of the planted seedlings.

Fertilization

When available, fertilizers will be applied to boost the growth of the crops and trees. Decomposed manure could be used as an alternative.

Irrigation

During drought periods (presumably this year, when a moderate El Niño is predicted), the farmer may use an overhead rotary sprinkler, which provides water by gravity.

Pests and disease control

Pests or diseases in the crops or trees should be carefully observed and noted/recorded. This should be part of the monitoring and evaluation of the demo farms. Crop rotation and diversity of crops will be part of the integrated pest management scheme that the farmer will practice.

Other silvicultural practices

Other silvicultural treatments or practices, particularly protection, shall be ensured. This will include protection from stray animals or wildlife. In addition, the native trees for timber production, e.g., almaciga shall be pruned as long as the height of man allows. Likewise, when the density of the trees becomes a limiting factor for further growth, particularly diameter growth, thinning should be employed to promote increased growth, particularly in the long-lived (late succession) native trees.

4.5.12 Monitoring and Evaluation

Monitoring of the demonstration farm will be done for two purposes. The first is to evaluate the progress of the learning site within the Project's duration, while the second is to measure ecosystem changes and assess the effectiveness of the restoration actions at the farm level beyond the Project's duration. These will be done by the LFPI and Village Government, respectively. Appropriate training will be conducted to implement monitoring.

The learning farm's progress and livelihood monitoring form is presented in Annex 2, and will be used monthly within the project period. For monitoring ecosystem services beyond the project, the indicators of the ecosystem services will be identified in a participative manner with the villagers. The indicators of ecosystem changes should be easily measurable, relevant, and practical. The results and

lessons will be communicated to all the local community members based on the project's communications plan. The success of shifting to a tree-based system hinges on generating information that manifests the economic and ecological superiority of the proposed schemes in the demo farm. This could be demonstrated through the robust data collection the demo farm can generate.

4.5.13 Institutional Arrangements

The legal status of Mr. Jamito's farm 2 is that it is a private titled area with secured tenurial status. In this case, he is not pressured to venture into a tree-based cropping system as a condition for his continuous engagement in vegetable farming. However, for him to mainstream conservation farming and tree-based cropping system, the prospect of agroforestry farm tourism may be a good incentive for him in the long run. Hence, there should be a close interagency partnership and collaboration. First, at the Lantapan LGU level, the provincial and regional bodies will jump-start tourism as the main banner program. This is in the hope of triggering other community-based income-generating enterprises such as food processing, putting up homestays, transforming the site into conference venues, and ecological camping combined with eco and cultural tourism in the sites.

4.5.14 References

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Annex 1: Native forest species potentially available in the region

Native forest species	Uses
Afzelia xylocarpa*	Wood carvings, medicinal
Dalbergia cochinchinensis*	Beautiful wood, multiple uses (in IUCN Red List of threatened and endangered species)
Dipterocarpus alatus	NTFP: Resin, paint, varnish, laquer
Dipterocarpus intricatus	Timber, resin
Hopea helferi	Timber, resin (threatened species)
Hopea odorata	Timber, resin, tannin
Sphaerocoryne affinis (= Mitrella mesnyi)	National flower: Rumduol (រំដួល). Ornamental (flower, fragrance, fruit)
Pterocarpus macrocarpus* (= Pteropcarpus pedatus)	Timber, ornamental, shade tree (threatened species)
Shorea siamensis	Timber, resin, medicinal
Shorea vulgaris (= Shorea guiso)	Timber, resin

Source: Project team

Note: * = leguminous species

Annex 2: Proposed Monitoring and Evaluation Tool for the progress of the Demonstration Farms

Farm progress and livelihood monitoring tool

This farm progress monitoring form is a tool to assess the status of the demonstration farm within the indicated monitoring period. This aims to inform the farmer and the concerned staff, typically the project proponents on the progress of the farm to ensure that the desired outcomes be realized.

In cases where "warnings" (issues and challenges) are observed, the person monitoring must notify the Landcare Foundation of the Philippines, Inc. for immediate action. Depending on the complexity of the issue, the Watershed Management Committee, World Agroforestry, and International Center for Environmental Management may also be commissioned for help. External actors such as the Municipal Agriculturist Office, the Protected Area Superintendent, and the Community Environment and Natural Resources Office can also be tapped depending on the needs of the farm.

A time series analysis on the survival rate, growth rate, and health status can be conducted to understand if considerable progress on farm status has been achieved.

* **I. Basic Information**

* **1a. Demonstration farm**

- ◯ Buffer zone, Mr. Yam-oc
- ◯ Bol-ogan, Mr. Ladera
- ◯ Talaandig school, PTA Officials
- ◯ Natural Forest, Mr. Jamito
- ◯ Protected Area, Mr. Valdueza

* **1b. Watershed**

- ◯ Alanib
- ◯ Maagnao

* **2. Name of Farmer**

_____

3. Name of Assisting Technical Staff

Write NA if not applicable

_____

4. Year of farm establishment

_____

5. Area developed

Indicate unit

_____

6. Progress monitoring period

In month, year. Example: October 01- December 31, 2023

---

* **II. Farm Progress Monitoring Tool**
* **» 1. Activities Conducted**

7. What are the activities you conducted within the monitoring period?

- [ ] Clearing/Brushing
- [ ] Contour lay-outing and sticking
- [ ] Contour line establishment (manual)
- [ ] Contour line establishment (with draft animal)
- [ ] Plowing
- [ ] Furrowing
- [ ] Hole digging
- [ ] Planting
- [ ] Replanting
- [ ] Weeding/Ring weeding
- [ ] Watering
- [ ] Maintenance contour
- [ ] Mulching
- [ ] Fertilizer application
- [ ] Pesticide application (includes fungicide, insectice, herbicide)
- [ ] Others

* **Specify other:**

Put 96 if not applicable.

---

8. If 'Planting' is conducted, what are the crops and trees you planted within this monitoring period?

example: mahogany, gmelina. Put 'None' if not applicable.

---

9. If 'Replanting' is conducted, what are the crops and trees you re-planted within this monitoring period? If not applicable, write 'None.'

example: mahogany, gmelina. Put 'None' if not applicable.

---

10. If 'Planting' and/or 'Replanting' are conducted, is the farm design (spacing, tree-crop combination) followed?

- Yes
- No

* **Why?**

_____

Why not?

_____

11. What are the farm inputs you applied within the monitoring period?

Select all that is applicable.

- Organic fertilizer
- Chemical fertilizer
- Organic fungicide
- Chemical fungicide
- Organic insecticide
- Chemical insecticide
- Organic herbicide
- Chemical herbicide
- Others

Others, specify.

_____

* **12a.1. Indicate type and/or brand of organic fertilizer used within the indicated period**

example: vermicompost

_____

* **12a.2. Indicate number of times organic fertilizer was applied within the monitoring period.**

_____

* **12a.3. Indicate rate of application of organic fertilizer within the indicated period**

Use proper units (example: kg/ha or l/ha)

_____

* **12b.1. Indicate type and/or brand of chemical fertilizer used within the indicated period**

example: urea, 14-14-14

_____

* **12b.2. Indicate number of times chemical fertilizer was applied within the monitoring period.**

_____

* **12b.3. Indicate rate of application of chemical fertilizer within the indicated period**

Use proper units (example: kg/ha or l/ha)

_____

* **12c.1. Indicate type and/or brand of organic fungicide used within the indicated period**

example: neem oil

_____

* **12c.2. Indicate number of times organic fungicide was applied within the monitoring period.**

_____

* **12c.3. Indicate rate of application of organic fungicide within the indicated period**

Use proper units (example: kg/ha or l/ha)

_____

* **12d.1. Indicate type and/or brand of chemical fungicide used within the indicated period**

example: furadan

_____

* **12d.2. Indicate number of times chemical fungicide was applied within the monitoring period.**

_____

* **12d.3. Indicate rate of application of chemical fungicide within the indicated period**

Use proper units (example: kg/ha or l/ha)

_____

* **12e.1. Indicate type and/or brand of organic insecticide used within the indicated period**

example: neem oil

_____

* **12e.2. Indicate number of times organic insecticide was applied within the monitoring period.**

_____

* **12e.3. Indicate rate of application of organic insecticide within the indicated period**

Use proper units (example: kg/ha or l/ha)

_____

* **12f.1. Indicate type and/or brand of chemical insecticide used within the indicated period**

example: Amistar

_____

* **12f.2. Indicate number of times chemical pesticide was applied within the monitoring period.**

_____

* **12f.3. Indicate rate of application of chemical insecticide within the indicated period**

Use proper units (example: kg/ha or l/ha)

_____

* **12 g.1. Indicate type and/or brand of organic herbicide used within the indicated period**

_____

12g.2. Indicate number of times organic herbicide was applied within the monitoring period.

_____

* **12g.3. Indicate rate of application of organic herbicide within the indicated period**

Use proper units (example: kg/ha or l/ha)

_____

* **12h.1. Indicate type and/or brand of chemical herbicide used within the indicated period**

_____

* **12h.2. Indicate number of times chemical herbicide was applied within the monitoring period**

_____

* **12h.3. Indicate rate of application of chemical herbicide within the indicated period**

Use proper units (example: kg/ha or l/ha)

_____

* **12i.1. Indicate type and/or brand used within the indicated period**

_____

* **12i.2. Indicate number of times applied within the monitoring period**

_____

* **123i.3. Indicate rate of application within the indicated period**

Use proper units (example: kg/ha or l/ha)

---

* **»2. Status of trees planted**

» » What is the status of your trees planted

* **13a. Tree species planted**

---

* **13b. Where on farm did you plant your tree?**

- ◯ Scattered in the farm
- ◯ Contour lines
- ◯ Farm boundary/live fence
- ◯ Woodlot
- ◯ Riverline section
- ◯ Fallow land
- ◯ Others

Specify others:

Put 96 if not applicable.

---

* **13c. Number of trees planted**

Put 9999 if actual number cannot be remembered

---

* **13d. Number of surviving trees**

Put 9999 if actual number cannot be remembered

---

* **13e. Percent (%) survival**

For those who cannot remember actual number, indicate the highest estimated range.

---

* **13f. Average circumference, in centimeter**

---

* **13g. Average diamater, in centimeter**

* **13h. Climate-related problems this monitoring period**

- ◯ Drought
- ◯ High precipitation
- ◯ Flood
- ◯ Erosion
- ◯ Others

* **Others, specify.**

* **»3. Climate-related problems**

* **14a. What demo-site components (plants, trees, animals) are affected by climate-related problems?**

Add rows for multiple components affected climate-related problems

* **14b. Photo of the symptom and/or sign observed**

Click here to upload file. (< 5MB)

* **14c. Provide observed impacts**

* **14d. What is your action taken?**

Write 'none' if none

* **14e. What are the results observed after the action was taken?**

Write 'none' if none

» Challenges

* **15. Challenges experienced**

Add more rows for multiple challenges

» Breakthroughs experienced

* **16. Breakthroughs experienced**

Add more rows for multiple breakthroughs

» Photos

* **17. Landscape photo of the farm**

Preferably using the Geocam to record coordinates and date taken.

Click here to upload file. (< 5MB)

Close up photos

Preferably using the Geocam to record coordinates and date taken.

Click here to upload file. (< 5MB)

Other relevant photo (3)

Click here to upload file. (< 5MB)

Other relevant photo (4)

Click here to upload file. (< 5MB)

Other relevant photo (5)

Click here to upload file. (< 5MB)

Did you harvest within this monitoring period?

It can be timber, non-timber, fruit, vegetables, and other crops

◯ Yes
◯ No

II. Livelihood Monitoring Tool

This farm-level livelihood monitoring form is a tool to assess the effect of restoration interventions on the livelihood of the farmers within the indicated monitoring period. This aims to inform the farmer and the concerned staff of the project proponents in the livelihood status of the farmer. It provides the actual income the farmer is gaining from the farm, it identifies which sources of income are

contributing most to his/her livelihood. The tool is likewise supplemented with context questions to find out how important forest products to the farmer. A time-series analysis of the household income and proportion of household income sources can be conducted if a considerable increase in income has been achieved.

---

* **18. » Livelihood in previous monitoring period**

Please indicate the estimated 'net income' you received in previous monitoring period.

---

* **18.a Sale of timber (previous monitoring period)**

---

* **18.b Sale of non-timber forest products (previous monitoring period)**

---

* **18.c Sale of fruits (previous monitoring period)**

---

* **18.d Sale of vegetables, root crops and other non-fruit high value crops (previous monitoring period)**

---

* **18.e Sale of livestock and poultry (previous monitoring period)**

* **18.f Others (previous monitoring period)**

Example: labor, remittance, etc.

---

* **18.g Others, please specify.**

Use comma (,) for multiple answers

---

* **19. » Livelihood this monitoring period**

Please indicate the estimated 'net income' you received this monitoring period.

---

* **19.a Sale of timber (this monitoring period)**

---

* **19.b Sale of non-timber forest products (this monitoring period)**

---

* **19.c Sale of fruits (this monitoring period)**

---

* **19.d Sale of vegetables, root crops and other non-fruit high value crops (this monitoring period)**

* **19.e Sale of livestock and poultry (this monitoring period)**

* **19.f Others (this monitoring period)**

Example: labor

---

* **19.g Others, please specify.**

Use comma (,) for multiple answers

---

20. Are you satisfied with the earnings you gained from restoration this monitoring period?

◯ Yes
◯ No

20.a If yes, cite the factors that have affected your satisfaction?

20.b If no, cite the factors that have affected your dissatisfaction?

---

21. Which of the following livelihood enhancement did you use for the postharvest?

Select all that is applicable.

☐ None
☐ Solar dryer pavement
☐ All weather/Plastic dryer
☐ Sorting shed/Warehouse facility
☐ Coffee Huller
☐ Abaca stripping machine
☐ Abaca decorticating machine
☐ Weighing scale

- [ ] Kitchen utensils for food processing
- [ ] Corn mill
- [ ] Corn sheller
- [ ] Cassava hammer mill
- [ ] Banana chipper
- [ ] Cacao processing equipment
- [ ] Bee keeping
- [ ] Others

* Others, specify.

---

22. Is timber important to the community in terms of livelihood?

- ◯ The community makes no money out of timber
- ◯ The community makes a little, occasional money from the timber, but this is minimal
- ◯ Timber sales are quite important to the economics of the community, but it could be improved
- ◯ Timber sales are of key importance to our community and make us a lot of money
- ◯ Not applicable

23. List the main species of timber collected for selling

Write 'None' if none

---

24. Are the NTFPs important to the community in terms of livelihood?

- ◯ The community makes no money out of non-timber forest products
- ◯ The community makes a little, occasional money from the non-timber forest products, but this is minimal
- ◯ Non-timber forest products sales are quite important to the economics of the community, but it could be improved
- ◯ Non-timber forest products sales are of key importance to our community and make us a lot of money
- ◯ Not applicable

25. List the NTFPs collected for selling

---

26. Are the agroforestry products such as local fruits and other commodities such as cocoa, coffee, and rubber important to the community in terms of livelihood?

- ◯ The community makes no money out of agroforestry products

◯ The community makes a little, occasional money from agroforestry products, but this is minimal

◯ Agroforestry products obtained is quite important to the economics of the community, but it could be improved

◯ Agroforestry products is of key importance to our community and make us a lot of money

◯ Not applicable

27. List the agroforestry products collected for selling

---

28. Is timber important to the community in terms of subsistence?

◯ The community does not use timber

◯ The community makes a little, occasional use of timber but this is minimal

◯ Timber is quite important to the subsistence of the community, but its usage could be increased

◯ Timber is of key importance to the subsistence of our community

◯ Not applicable

29. List the main species of timber collected for personal usage

---

30. Are NTFPs important to the community in terms of subsistence?

◯ The community does not use non-timber forest products

◯ The community makes a little, occasional use of non-timber forest products but this is minimal

◯ Non-timber forest products are quite important to the subsistence of the community, but its usage could be increased

◯ Non-timber forest products are of key importance to the subsistence of our community

◯ Not applicable

31. List the main NTFPs collected for personal usage.

---

32. Are agroforestry products such as local fruits including commodities such as cocoa, coffee, and rubber importantto the community in terms of subsistence use?

◯ The community does not use agroforestry products

◯ The community make a little occasionally use of agroforestry products, but this is minimal

◯ Agroforestry products use are quite important to the subsistence of the community, but it could be increased

◯ Agroforestry products are of key importance to the subsistence of our community

◯ Not applicable

33. List the main agroforestry products collected for personal usage.

Additional note

Ecological restoration efforts. Crops growing in Jamito farm, Philippines (photo by ICRAF).

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