The Smart Tree-Invest project: Climate-smart, Tree-based Co-investment in Adaptation and Mitigation in Asia

"In the vulnerable rural landscapes of the project sites, Smart Tree-Invest piloted the schemes for co-investment in ecosystem services that can make smallholders less vulnerable while improving ecosystem services provision from the landscape"

Project Report

World Agroforestry Centre

The Smart Tree-Invest project: Climate-smart, Tree-based Co-investment in Adaptation and Mitigation in Asia

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Investing in rural people

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The Smart Tree-Invest project: Climate-smart, Tree-based Co-investment in Adaptation and Mitigation in Asia

G-I-1452-ICRAF

Grant Completion Report

April 2014–March 2017

Grant Title	Climate-smart, tree-based co-investment in adaptation and mitigation in Asia
Recipient	International Centre for Research in Agroforestry (ICRAF, the World Agroforestry Centre)
IFAD Originator/Sponsor	Ganesh Thapa/Fabrizio Bresciani, Asia and the Pacific Division
Grant Objectives and links to the Strategic Objectives/SF and Grant policy	The grant responds to the objectives of IFAD's Strategic Framework, its Grant Policy, as well as to the priorities of APR grants strategy.
Beneficiary Countries	Indonesia, Philippines, Viet Nam
Proposed IFAD Grant Amount Co-financing Total Programme Cost	USD 1,500,000 USD 750,000 USD 2,250,000
Projected Executive Board Date	April 2013
Programme Duration	3 years (April 2014–March 2017)
Target Group and Benefits	1) Policymakers in Indonesia, the Philippines and Viet Nam; 2) Smallholder farmers in less productive environments in the three countries, who are vulnerable to environmental degradation and climate change; and 3) Policymakers, including IFAD and other development agencies, in neighbouring countries and globally
IFAD Projects Likely to Benefit	Indonesia: The Rural Empowerment for Agricultural Development (READ) Programme in Central Sulawesi, Indonesia (2008–2014) The Philippines: The Integrated Natural Resources and Environmental Management Project (INREMP) in Bukidnon Viet Nam: a follow-up to the nearly completed Programme for Improving Market Participation of the Poor (IMPP) in Ha Tinh (2008–2012) and the Decentralized Programme for Rural Poverty Reduction (DPRPR) in Quang Binh

Abbreviations

ALSA	Association of Lantapan Sustainable Agro-ecological Zone
CaSAVA	Capacity Strengthening for Vulnerability Assessment
CIS	Co-investment in environmental stewardship (ecosystem services)
CSA	Climate-Smart Agriculture
DARD	Department of Agricultural and Rural Development
IFAD	International Fund for Agricultural Development
INREMP	Integrated Natural Resources and Environmental Management Project
KIN	Kitanglad Integrated NGO (a Local NGO in Lantapan)
PAG	Project Advisory Group
PES	Payment for Ecosystem Services
RAPID	Rural Agro-enterprise Partnerships for Integrated Development
READ	Rural Empowerment and Agricultural Development
Smart Tree-Invest	Climate-smart, tree-based co-investment in adaptation and mitigation in Asia
SRDP	Sustainable Rural Development for the Poor
WG	Working group

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Executive Summary

From April 2014 to March 2017, the World Agroforestry Centre (ICRAF) initiated the *Smart Tree-Invest* project, which stands for Climate-smart, tree-based co-investment in adaptation and mitigation in Asia in Indonesia, Viet Nam, and the Philippines. In the vulnerable rural landscapes of the project sites, Smart Tree-Invest piloted the schemes for co-investment in ecosystem services that can make smallholders less vulnerable while improving ecosystem services provision from the landscape.

Building on the lessons from the preceding IFAD's funded RUPES phase I and II project, ICRAF worked closely together with national and local stakeholders to develop a co-investment scheme that aims to simultaneously maintain ecosystem services *and* improve the resilience of smallholders in vulnerable landscapes. Tree-based farming (agroforestry) was chosen as the main approach in the co-investment schemes owing to livelihood benefits for smallholders and environmental benefits through the provision of various ecosystem services.

This report summarizes the experience and lessons learnt from piloting the co-investment schemes in the three countries through the Smart Tree-Invest project. As a grant project, it was linked with IFAD loan projects in each country (the previous loan of READ phase 1 in Indonesia, ongoing INREMP in the Philippines and SRDP in Viet Nam, and the upcoming READ-SI in Indonesia and SOLID in the Philippines). These loan projects influenced the design and implementation of the Smart Tree-Invest project.

The project consisted of three main phases: scoping (research), intervention and mainstreaming. Smart Tree-Invest started with the effort to understand landscape characteristics, particularly with regards to vulnerabilities and actions to improve smallholder resilience. The project then initiated pilot co-investment activities with smallholders and local development actors. In the final phase, the lessons learnt and best practices were integrated with government policy and programs at local and national levels.

The project took a landscape approach that identifies project sites as clusters or typologies with similar ecological and socio-economical traits. Each country site's unique characteristics (i.e. the problems, threats, strengths, and opportunities) defined the design of its co-investment schemes. The typology resulted from the landscape approach will provide models representing the contexts, proposed actions and solutions that may contribute as inputs for further replications and scale-ups to other areas matched with the typologies within certain jurisdiction boundary (i.e. national, province, district).

In Buol District, Indonesia, where farmers lack human capital to manage their tree farms, the project established voluntary tree-farm learning groups that aimed to improve the capacity of smallholders to develop and manage their tree farms. The Buol site was also home to a pilot for participatory watershed service monitoring and utilization of decentralized public fund to achieve 'green development' at the village level, and watershed conservation at the landscape level. In Viet Nam's Ha Tinh and Quang Binh Provinces, the project strengthened local home gardens and sloping lands with agroforestry practices that integrated fruit trees, grass strips, annual crops and understorey. These land uses are parts of the overall watershed management that may contribute to the increment of both local resiliences and ecosystem service provisions for the downstream hydropower company. In Lantapan Municipality, the Philippines, smallholders were trained in agroforestry methods to enrich their intensive seasonal crops, particularly on sloping lands, by combining them with trees. The sloping-land agroforestry systems are potential in maintaining the capacity of watershed to support local livelihood and continuously produce ecosystem services particularly for large-scale agribusiness and other industries, by engaging local communities and indigenous people.

In all sites, the Smart Tree-Invest strengthened and collaborated with multi- stakeholder and their (existing) forums to develop the co-investment schemes. A series of capacity-building activities prepared the forums to continue, replicate, and upscale the schemes after the project's conclusion.

Initial project results have influenced local governments to adopt the approach and methods into local development activities. In Buol, the local government integrated the ecosystem service co-investment principle in the upcoming district regulations on the Corporate Social Responsibility and Village Fund, and used the district development budget to replicate the tree-farm learning group, tree monitoring and participatory watershed monitoring in 2017. This may provide strategic lessons to design conservation agriculture and green development funds in Indonesia through IFAD supported investments and grants. In Viet Nam, the project facilitated local authorities to enact available local policies to support the upscaling of sustainable home-garden and sloping-land models, and provide inputs to improve the Payment for Foresty Ecosystem Services (PFES) national policy and regulations. The project also improved the Climate-smart agriculture approach adopted by SRDP, an IFAD loan project. In the Philippines, the Mindanao Development Authority expressed interest in allocating their PES funding to support the co-investment schemes initiated by the project. This experience was to enrich the existing pilot of PES under the Family Contract scheme, and to provide lessons for applying similar approach to the Philippines National Greening Program.

Several lessons were drawn for the development of co-investment schemes. One is that local contexts: ecological, socioeconomic characteristics and communities' needs must be understood before designing options of co-investment activities. Such understanding can be acquired by combining a scientific approach with participatory research that acknowledges local wisdom, perspectives, and preferences. Additionally, multi-stakeholder support is essential for the success of both the research and action components of the project. It must be secured in parallel with the awareness raising and capacity building activities to ensure that local stakeholders have the knowledge, capacity, ownership and legitimacy to implement and replicate the project approach. A final lesson is that conditional public and private funds can be considered potential sources of the incentives/rewards for the co-investment scheme for the smallholders.

Photo: World Agroforestry Centre/Sidiq Pambudi

1. Introduction

Most countries have committed to adopt the 2030 UN Agenda for Sustainable Development, *Transforming our World*. This global agenda broadly relates to human dignity, prosperity, protecting the biosphere, and promoting peace and security. As countries are formulating indicators to track their progress towards the targets, they struggle with unpredictable socioeconomic and political shocks and present and future climate change, which is increasing the vulnerability of local populations to declining agricultural yields and food security, soil erosion, flash floods, and long-term freshwater shortages.

In addition, the planet's agricultural land needs to achieve a 70% increase in production to meet the demand for food from a growing population. However, the smallholding farmers in Asia and the Pacific that are crucial to feed this growth are also exposed to financial and environmental risks from changes to the climate. Their vulnerability is further increased by weak capacity to adapt to changes.

Approximately 560 million people live in agricultural ecosystems with more than 10% tree cover, mitigating climate change by maintaining these production landscapes and adapting to changing conditions. Climate-smart, tree-based agriculture can maintain the land's capacity to provide ecosystem services (ES) while intensifying production. Containing a diverse range of tree species under agroforestry practices, these agricultural landscapes are important habitats for plant and animal biodiversity, help maintain connections between forest fragments, and support healthy watersheds by buffering variations in rainfall.

Smallholders in Southeast Asia have traditionally engaged in agroforestry practices which provide food security, income, and conservation. These practices, however, are gradually being replaced by more intensive systems that focus on productivity while reducing the landscape's capacity to provide ES. Continuing environmental degradation will worsen smallholders' ability to adapt to changes, creating a vicious circle.

Previous lessons[1] show that involving smallholders in maintaining and providing ES can help to attain conservation and poverty alleviation by granting them access to livelihood capital sources and co-benefits from ES. Further experience from the context of developing countries shows it is necessary to frame payment for ES as a co-investment mechanism between smallholders (as ES providers) and external stakeholders (as ES beneficiaries). The schemes are shown to be potential in reducing vulnerability to climate change and providing an efficient and fair way to invest private and public rural development funds. After all, co-investment by communities, governments, and businesses builds trust and a sense of shared responsibility to accomplish the dual goals of improving livelihoods and maintaining ecosystem services.

The Smart Tree-Invest project has been working toward improving the livelihoods and resilience of smallholding farmers by reducing their vulnerability to shocks, including climate change. The program has worked with smallholders, both female and male, in vulnerable rural areas in Indonesia, Viet Nam and the Philippines to help create local solutions in collaboration with governments, development agencies and the private sector. Smart Tree-Invest has paid special attention to

[1] From Rewarding Upland Poor for Environmental Services (RUPES), an IFAD grant project implemented by the World Agroforestry Centre (ICRAF). From 2002 to 2012, RUPES piloted the development of Payment for Ecosystem Services schemes in several Asian countries, including Indonesia, Viet Nam, the Philippines, China, India, and Nepal.

developing benefits from external public and private funding through links with payment and co-investment for ecosystem services.

This report summarizes the experiences and lessons learnt from piloting a co-investment scheme in the three countries under the Smart Tree-Invest project. It is divided into ten sections; the first and second provide project background, the third section reviews the project achievements, while the fourth section frames project achievements within IFAD's strategic objectives. The fifth and sixth sections elaborate on the project's financial and management, while sections seven and eight explain the innovation and sustainability plan produced by the project. The last two sections present the conclusions and lessons learnt, and major lessons for IFAD.

2. Grant Description and Implementation Arrangements

2.1 Grant goal, objectives, components, and target groups

The Smart Tree-Invest project will achieve its goal of improving the livelihoods and resilience of smallholding farmers through the promotion of climate-smart, tree-based agriculture in Indonesia, the Philippines and Viet Nam through three interrelated components.

1. **Gender-sensitive assessments of vulnerability, adaptation and mitigation**
   Objective 1: To assess climate-change vulnerability of female and male farmers and to synthesize local ecological knowledge that reduces vulnerability.

   Expected outcome 1: Gender-specific knowledge for smallholder households to cope with climate-change risks and reduce vulnerability.

2. **Co-investment in ecosystem service provision**
   Objective 2: To enable local communities to devise climate-smart, tree-based adaptation practices in collaboration with the co-investing beneficiaries of the ecosystem services

   Expected outcome 2: Livelihoods' benefit flows from mitigation and adaptation actions under extreme climate events.

3. **Mitigation and adaptation strategies for the local and national public and private sector**
   Objective 3: To integrate gender-responsive, culture-sensitive climate-change mitigation and adaptation actions and improved livelihoods for smallholding farmers into mainstream policies and programs.

   Expected outcome 3: Mainstream smallholders' tree-based farming systems in climate change adaptation and mitigation.

In its initial stage, the project consulted with stakeholders, including representatives from national and local governments, and captured background information on the changes in policy and programs to be enacted during the project period and their impact on the project.

Special emphasis was placed on information from IFAD Country Offices/IFAD country program officers, and IFAD loan projects in each country (the ongoing INREMP in the Philippines and SRDPP in Viet Nam, and the finalized READ Phase 1 in Indonesia) that influenced the design of this project's activities. The information included the potential integration with and synergy between IFAD loan and grant projects' sites, activities, resource mobilization and knowledge management.

Smart Tree-Invest targeted three groups of beneficiaries: 1) female and male smallholders in less-productive environments in the three countries, who are vulnerable to environmental degradation and the impacts of climate change; 2) policymakers in Indonesia, the Philippines and Viet Nam at local, sub-national and national levels; and 3) policymakers, including IFAD and other development agencies, in neighbouring countries and globally.

This project considered gender as an important cross-cutting aspect from the beginning to the end. Thus, gender-sensitive assessments and co-investment schemes are integrated under the different

expected outcomes. Smart Tree-Invest has involved a wide-range of participants, from communities to decision-makers and NGOs, as summarized in tables 1 and 2 below.

Table 1. Estimated outreach by target group

Targeted beneficiaries	Total number of people to be reached by the end of project implementation period	Number of people reached until the end of project (cumulative)	
		Total number	Of which women
Female and Male smallholders in the three vulnerable sites	At least 400 rural poor as participants of co-investment schemes	Approx. 400 smallholders in Indonesia, Viet Nam, and the Philippines were involved in pilot activities for the co-investment of ES schemes	134 women were involved in pilot activities for the co-investment of ES schemes
		Approx. 120 smallholders are involved in the project replication activities officially supported by the local partners	No data available as actions at the household level
	At least 1200 rural poor as non-participants of co-investment schemes	161 smallholders voluntarily adopted the project approach without formal support from local officials	No data available as actions at the household level
		1,100 people were involved as respondents for the CaSAVA framework and landscape visioning in Viet Nam, Indonesia and the Philippines	529 women were involved as respondents for the CaSAVA framework and landscape visioning
		More than 1,100 respondents were interviewed for the socio-economic and vulnerability assessment at household level in the three countries	510 women were respondents of the household socio-economic and vulnerability assessment survey
Policymakers in Indonesia, the Philippines and Viet Nam	At least 120 government officers in Indonesia, the Philippines and Viet Nam	86 sub-national policymakers in Indonesia, Philippines, and Viet Nam were involved in local inception workshops	24 policymakers were from the sub-national level; 1 was from the national level
		6 national policymakers participated in the regional inception workshop	32 female government officers joined the working group in Viet Nam, Indonesia, and the Philippines
		92 government officers joined the working group in Viet Nam, Indonesia, and the Philippines	23 policymakers were from the sub-national level
		105 sub-national policy makers in Indonesia, Philippines and Viet Nam were involved in the final local workshop	17 women attended the regional closing workshop
		6 national and 11 sub-national policy makers, and 15 development	

Targeted beneficiaries	Total number of people to be reached by the end of project implementation period	Number of people reached until the end of project (cumulative)	
		Total number	Of which women
		organization officers from the three countries (including IFAD) were involved in regional final workshops	
Policymakers, including IFAD and other development agencies, in neighbouring countries and globally	3 IFAD Country Officers in Indonesia, Viet Nam and the Philippines	1 IFAD Country director ad 3 IFAD Country Officers were informed and involved in project implementation and finalization Collaboration with local IFAD project (SRDP and INREMP), and other development agencies Involvement of private tree-seedling and oil-palm companies in the co-investment schemes in Viet Nam and Indonesia respectively	1 Country Officer was female

Table 2. Smart Tree-Invest Target Output and Achievement as of August 2017

Target Output	Achievement/Remarks
300 surveyed households in three countries	More than 1000 households were surveyed in three countries
60 focus group discussions conducted to investigate local knowledge	More than 100 focus group discussions were conducted; they were attended by 1,100 participants from smallholders and local decision makers
24 community training sessions to sensitize ecosystem services' business perspectives	• 33 community training sessions in year 1 and year 2 • Approx. 36 training sessions for the community and 4 for governments, NGOs, and development agencies in year 3
3 participatory and site-specific prototypes of business cases developed in each country with 30 focus group discussions prior to the process	• 1 business case bundle in the Philippines • 2 business case bundles (with district development fund and Village Fund) developed in Indonesia • 1 profitability analysis on different farming systems including the proposed CSA models have been developed in Viet Nam
100 households with access to adaptation and mitigation funds	• 240 smallholders have joined the tree-farming learning groups in Indonesia. Another 90 smallholders joined post-project replication activities • 92 female and male smallholders have joined the AF enrichment initiatives in home gardens (43 households) and sloping land (6 households) in Viet Nam. Another 17 households joined the replication supported by local authorities, and 161 households voluntarily adopted the project approach • 61 smallholders joined the PES initiatives in the Philippines

Target Output	Achievement/Remarks
12 documents for policy advocacy, including technical advisory notes (TANs)	• 1 regional project site profile book was published in year 2, providing an initial basis for ES business cases • 4 video baselines and 3 photo-voice compilations about farmers' perceptions on their environment were produced • 4 video and 2 photo-voice compilations on the project's initial impact • 6 other videos (teasers, mainstream and local TV coverage) were produced for the projects • 11 working papers on vulnerability assessments and the role of the landscape were published • 2 policy briefs and 11 technical guidelines were produced
18 seminars and/or training sessions at district, provincial and national levels and 2 Asia-wide workshops initiating and synthesizing the project's findings and lessons	• 4 Asia-wide workshops • 2 national workshops • 4 training sessions and 23 local workshops with local stakeholders (government, NGOs) in three countries
A set of recommendations on action plans for the COSOP in the three countries.	1 technical advisory note and 1 grant completion report

2.2 Changes in grant implementation context, grant design, and outreach occurred throughout grant life

No changes in grant implementation context and grant design occurred throughout the reporting period.

3. Review of Performance and Achievements, by Component

3.1 Review of the project phases

The Smart Tree-Invest project consisted of three main phases: scoping (research), intervention, and mainstreaming. The scoping phase began with an effort to understand the landscape characteristics, particularly in terms of vulnerability and potential actions to improve smallholder resilience. The intervention phase initiated pilot activities for co-investment with smallholders and local development actors. The final mainstreaming phase integrated the lessons learnt and best practices into local and national government policy and programs.

Prior to that, the project team and IFAD representatives of each country scoped potential project sites. A valid project site must be a rural area dominated by agricultural practice, with a high degree of poverty compared to the national and local indicators, and the presence of potential threats to smallholder livelihoods and ecosystem services, particularly from the changing environment and climate. Based on these criteria, the project selected Lantapan Municipality (the Philippines), Buol District (Indonesia), and Ha Tinh and Quang Binh Provinces (Viet Nam) as the project sites.

Smart Tree-Invest applies an action-research mode using a landscape approach, in which project sites are redefined as 'clusters' beyond their administrative boundaries. Each cluster shares similar biophysical (i.e. farming systems, ecosystem services' potential), anthropogenic (e.g. ethnicity, migratory status) and social characteristics. The Smart Tree-Invest sites in the three countries are listed below.

Table 3. Smart Tree-Invest cluster sites

Country	Cluster site(s)	District(s), Municipalities, Province(s)	Landscape typology	Potential ecosystem services for co-investment
Indonesia	1. Buol watershed (upstream) 2. Buol watershed (midstream) 3. Mangrove coastal area	Buol, Central Sulawesi	1. Upland watershed 2. Coastal ecosystem	1. Coastal protection and provisioning services 2. Hydrology function; river bank and soil protection; carbon sequestration and food provision
Philippines	Manupali watershed on the border of Mount Kitanglad National Park 1. Tugasan sub-catchment 2. Alanib sub-catchment 3. Kulasihan sub-catchment	Lantapan, Bukidnon	1. Mountain (protected landscape) 2. Watershed	1. Water supply for hydroelectric power plant 2. Irrigation for multinational agrobusinesses 3. Agrobiodiversity and landscape beauty

Country	Cluster site(s)	District(s), Municipalities, Province(s)	Landscape typology	Potential ecosystem services for co-investment
Viet Nam	1. Upstream communes in Ha Tinh Province 2. Downstream commune in Quang Binh Province	Huong Khe, Ha Tinh and Tuyen Hoa, Quang Binh	Watershed	1. Community forest management 2. Home garden development 3. Indigenous tree planting on the contour-line border with forest 4. Water supply for water company and hydropower plant

The location of the sites and their links with the IFAD Loan project sites are shown in the figure below.

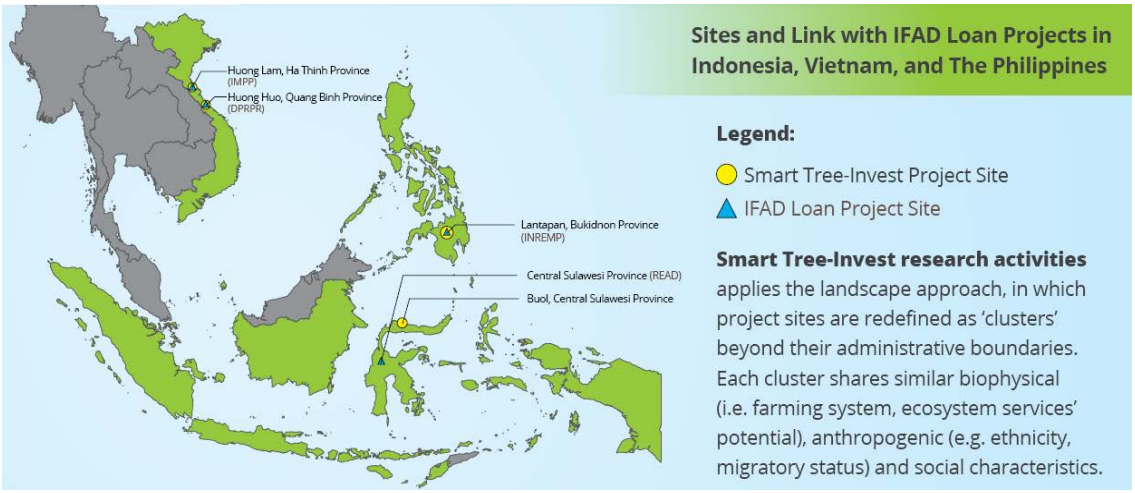

Figure 1. Locations of the Smart Tree-Invest sites

First year (scoping phase): The project carried out assessments of vulnerability, local resilience, landscape characteristics and role of smallholders in managing landscapes. The assessment was done using the Capacity Strengthening Approach to Vulnerability Assessment (CaSAVA) research framework developed by the World Agroforestry Centre. It covers socio-economic, environmental and biophysical issues. CaSAVA is used not only to assess the vulnerability and resilience of smallholders, but also as a capacity-strengthening tool. It allows female and male farmers to reflect on their local conditions. The data from the vulnerability assessment was analysed and published in working papers and a synthesis book (*Table 4*).

Smart Tree-Invest also applied visual participatory techniques using photos and videos to capture and monitor the changes of farmers (i.e. their awareness, knowledge and behaviour) and their perceptions of their landscapes. The project team provided community members with cameras to capture their social and ecological surroundings. Their comments were recorded by the video makers for comparison before and after the project.

Second year (intervention phase): the project carried out additional research to further improve understanding of the landscape and communities, thus completing information for co-investment in

ES. Simultaneously, the project team conducted capacity-building and awareness-raising activities for local stakeholders, particularly the local government and the community, to prepare for co-investment in ES. The project also helped establish multi-stakeholder coordination bodies consisting of local development actors from various sectors to improve the cooperation and collaboration between actors and support the implementation of co-investment.

Third year (mainstreaming phase): based on the activities initiated in the previous years, the project more intensively collaborated with the local partners such as the local government, community and other development organizations, to upscale and mainstream the lessons learnt and best practices that flowed from the research and pilot implementation. The project also re-applied the participatory visual techniques to identify and visually record the impact of the project from the community perspectives.

3.2 Component 1: Gender-sensitive assessments of vulnerability, adaptation and mitigation

Objective: To assess climate-change vulnerability of female and male farmers and to synthesize local ecological knowledge that reduces such vulnerability.

Main activities

Vulnerability Assessment

The project assessed the vulnerabilities of smallholders and the role of the landscape in the provision of ecosystem services. The vulnerability assessment of social conditions and community exposure, sensitivity and resilience was carried out through surveys among smallholder households and focus-group discussions using the CaSAVA framework, which consists of group discussions on such themes as biodiversity, hydrology, roles of trees and crops, drivers of land-use change, and Shocks-Exposure-Response-Impact. The discussion was disaggregated between male and female smallholders to capture gender perspectives on the particular themes. It yielded information about the extreme events and socio-economic shocks that impact the livelihoods of people living in the project sites, the existing adaptation measures, and the adaptation activities' potential to cope with the shocks.

Box 1: Capturing local-knolwedge on extreme events in the Buol upstream cluster

Figure 2 presents the captured local-knowledge regarding the shocks (extreme events) that highly influence the smallholders' livelihood. The team then explored the causes and impacts of each shocks, and the existing local adaptation-mitigation efforts to response the causes and impacts. Further, the team also inquired the local community on the ideal efforts that they perceived could have been implemented to resolve with the cause and/or impacts, and what are the barriers to implement the identified ideal efforts. Within CaSAVA framework, capturing these local knowledge and perception becomes a central element in understanding the local vulnerability characteristic and, in the efforts to address the vulnerability, design the appropriate co-investment in the project sites.

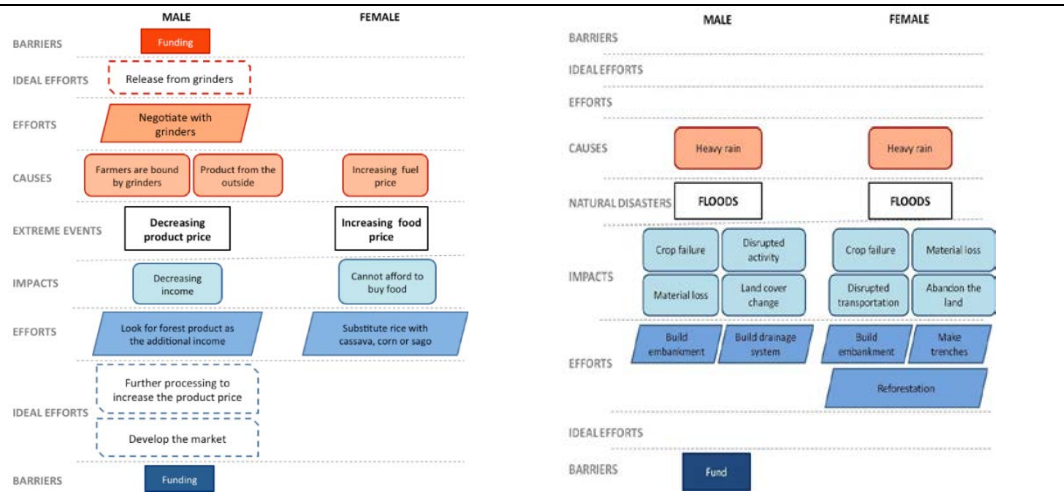

Figure 2a and 2b. Extreme events that negatively impact the smallholders in the Upstream Cluster site of Buol, Indonesia

The project assessed the role of the landscape for local livelihoods and ecosystem services through a series of focus group discussions and field surveys at each cluster. For this purpose, the project team assessed the characteristics of (1) landscape, including tree-species, biodiversity conditions, hydrological patterns, climatic variability and its trend overtime; (2) farming systems and their change over time, particularly during years of harsh conditions. The results from the focus group discussions and field data, including spatial analysis of land use and land cover change, were then used to determine potential ecosystem services such as carbon sequestration, biodiversity conservation and watershed function.

The results of the vulnerability assessment in the three countries are synthesized in the project's cluster profile book[2]; publication output based on this components' activities are excerpted in *Table 4* below.

Table 4. Publications from the vulnerability assessment under Component 1

Country	Publication Title	Type	URL and link
Regional	Cluster Profile - Climate-Smart, Tree based Co-investment in Adaptation and Mitigation in Asia (Smart Tree-Invest)	Book	Available
Indonesia	Potential and challenges in implementing a co-investment in ecosystem services scheme in Buol District, Indonesia*	Working paper	Available
Indonesia	Tree diversity and its utilization by the local community in Buol District, Indonesia*	Working paper	Available
Indonesia	Vulnerability of smallholder farmers and their preferences on farming practices in Buol District, Indonesia*	Working paper	Available

[2] Amaruzaman S, Leimona B, Dewi S, Lusiana B, Catacutan DC and Lasco RD, (eds). 2015. Cluster Profile Climate-Smart, Tree-Based, Co-investment in Adaptation and Mitigation in Asia (SMART TREE-INVEST) Project. Bogor, Indonesia. World Agroforestry Centre (ICRAF) Southeast Asia Regional Program. 100 p.

Country	Publication Title	Type	URL and link
Indonesia	Dynamics of Land Use/Cover Change and Carbon Emission in Buol District, Indonesia	Working paper	Available
Indonesia	Kajian Kelayakan dan Pengembangan Desain Teknis Rehabilitasi Pesisir	Working paper (Indonesian)	Available
Philippines	Gender perspectives in smallholder farming practices in Lantapan, Phillipines	Working paper	Available
Philippines	Vulnerability of smallholder farmers in Lantapan, Bukidnon	Working paper	Available
Viet Nam	Vulnerability and adaptive capacity of smallholder farmers in Ho Ho Sub-watershed, Ha Tinh Province, Viet Nam	Working paper	Available
Viet Nam	Local knowledge on the role of trees to enhance livelihoods and ecosystem services in Ho Ho Sub-watershed, north-central Viet Nam	Working paper	Available
Viet Nam	Landuse/cover change in Ho Ho Sub-watershed, north-central Viet Nam	Working paper	Available
Viet Nam	Case study: Huong Khe district, Ha Tinh province, Viet Nam. Characterising agro-ecological zones with local knowledge.	Working paper	Available
Indonesia	*Ketahanan pangan dan Status Gizi Ibu dan Anak pada Masyarakat di Kabupaten Buol* (Food security and nutrition status of women and children in smallholder households in Buol)	Research Report (Indonesian)	Available
Indonesia	*Survey Sosio-Ekonomi skala Rumah Tangga di Kabupaten Buol, Provinsi Sulawesi Tengah: Penjelasan data dan kuesioner* (Socio-economic household survey baseline in Buol: Data and Questionnaire)	Research report (Indonesian)	Available
Viet Nam	Landscape and hydrological appraisal as a tool for developing payment for ecosystem services: a case study in Ho Ho sub-watershed, northern central Viet Nam	Working paper	In progress
Indonesia	Strengthening smallholders' resilience and improving ecosystem services provision in Indonesia: Experience from Buol District, Central Sulawesi	Peer-reviewed article	Under review
Philippines	Land cover change analysis of Manupali Watershed in Bukidnon using object-based image classification	Research report	In progress
Philippines	The Impact of land cover and climate change on present and future watershed condition in Manupali Watershed, the Philippines	Research report	In progress

*Also available in Indonesian (Bahasa Indonesia)

Ecosystem services assessment

A deeper understanding of the landscape is essential to ensure integrated solutions that address the needs of smallholders, reduce their vulnerability, and improve their livelihoods, while contributing to the provision of ES. The project assessed the ecosystem services the landscape could provide, and simulated the impact of the changes in landscape on the environmental quality and smallholders' livelihood conditions. The assessment was carried out to provide input to develop co-investment schemes, including activities and information to negotiate with potential co-investors.

In the three countries, Smart Tree-Invest made assessment on the impact of landuse strategies to landscape multi-functions using GenRiver and FALLOW (Forest, Agroforest, Low-Value Landscape or Wasteland?) model as tools. The GenRiver as hydrology model assessed the impact to watershed functions such as total river discharge and ground flow, while FALLOW makes projection to carbon storage and household's income in the watershed.

Box 2: Impacts on tree-cover intensification to watershed functions in Ho Ho watershed

In Viet Nam, the Gen River and FALLOW models assessed the impact of three tree-cover intensification scenarios: (1) business as usual (BAU) where the landscape is dominated by degraded natural forests; (2) expansion of short-term acacia plantation, and (3) forest enrichment by native tree species. The GenRiver model informs that natural regeneration of the degraded forests through native-species tree planting, can reduce surface run-off and erosion/sedimentation hazard, and simultaneously increase soil water storage and contribution of ground flow to river discharge. On the other hand, the expansion of acacia plantation induces high surface run-off that contributes to better river discharge but also alarming sedimentation rate to the river and the dam. The FALLOW model informs the trade-off between carbon storage and household income, when comparing the three scenarios. A new short-term acacia plantation can provide an income of 5 million VND (250 USD) ha^{-1} $year^{-1}$ to smallholder farmers, with a 34% and 42% lower in total watershed C-stock compared to BAU and forest restoration scenario respectively. The results have been informed to local stakeholders in Viet Nam through several workshops, and are scheduled for publication at the end of 2017.

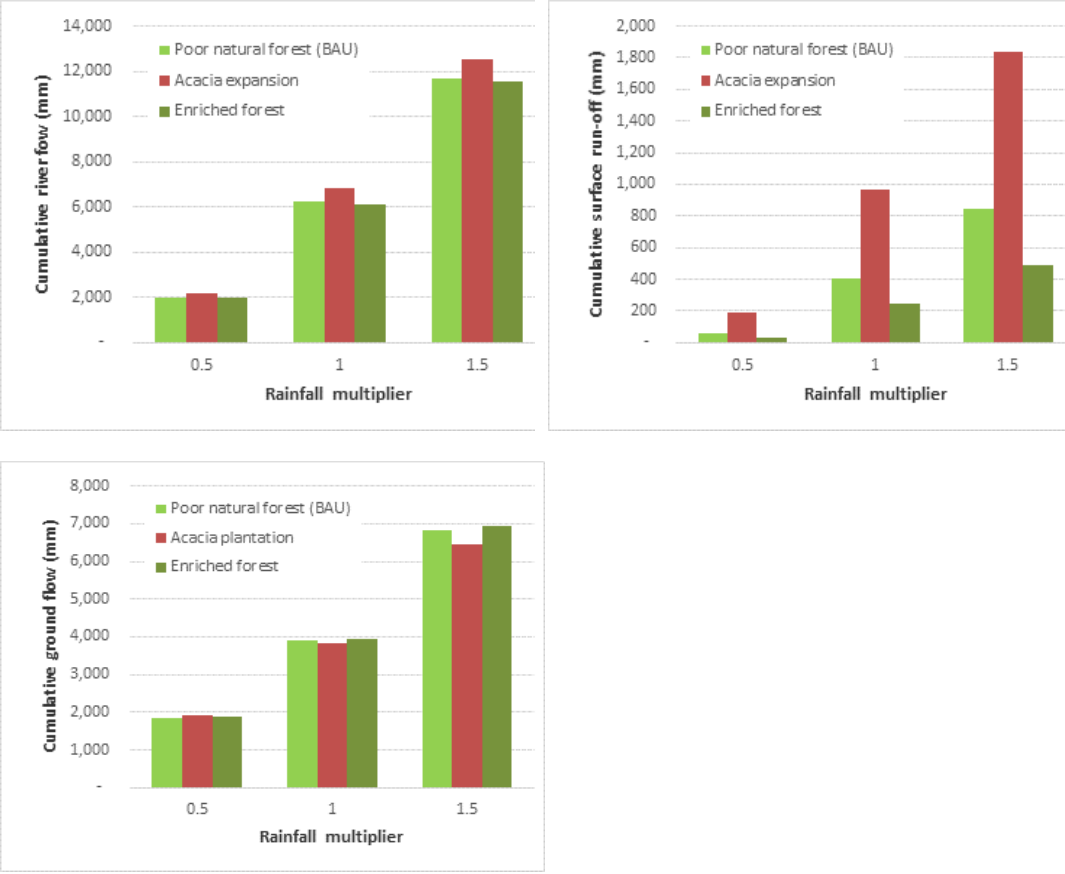

Figure 3. GenRiver Model Cumulative Results of 5 simulation years in Ho Ho Watershed, Viet Nam (Upper-left: River flow, Upper-right: Surface run-off, Lower-left: Ground flow)

Box 3: Participatory watershed monitoring and impacts on oil palm and crops to watershed functions in Buol watershed

In Indonesia, the team involved the local community in watershed monitoring activities to gather reliable hydrological data from June 2015 to June 2016. Residents along the riparian area in the Buol watershed were trained to monitor rainfall and water debit (*Figure 4*). This participatory monitoring aimed to collect scientific data for hydrological assessment and to increase the local community's awareness of the importance of monitoring changes in their landscape.

Figure 4. Participatory watershed monitoring in Buol, Indonesia

The primary data collected by the Smart Tree-Invest team became the inputs for modelling the hydrological patterns in the Buol watershed. This information has been presented to the local government. The team also trained local government and stakeholders in collecting and analysing the watershed data for further designing and monitoring sustainable watershed management of Buol watershed. The GenRiver model was applied to assess the impact of land use changes on hydrological condition in the next 20 years (2016-2035) under five scenarios: (1) reforesting all the available farming lands in the watershed ("forest" scenario); (2) no land use change which means the watershed area is still dominated by 67% forest and 18% oil palm over 20 years. This scenario is a benchmark for other scenarios ("actual" scenario); (3) enriching the farming lands with tree-based agroforestry system up to 70% area ("agroforestry" scenario); (4) expansion of oil palm monoculture plantation up to 70% of the area ("oilpalm" scenario); and (5) expansion of maize and upland rice field up to 70% of the area ("crop" scenario). The future simulation shows that the agroforestry, oil palm and crop scenarios will increase the surface flow and reduce both the subsurface flow and base flow (Figure 5). Compared to other scenarios, the expansion of agroforestry has the lowest impacts on watershed degradation, whilst the system is also beneficial for improving the smallholders' livelihood.

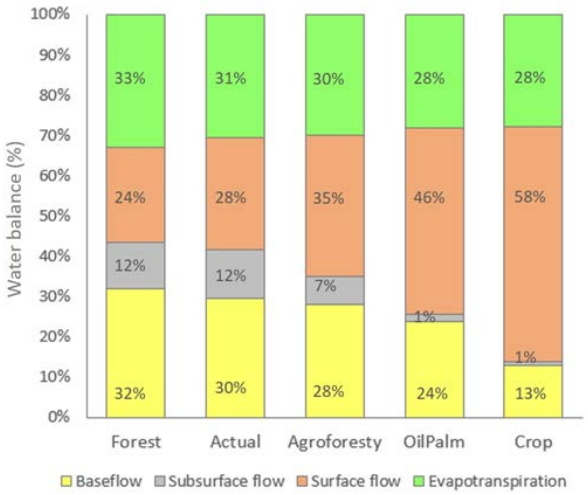

Figure 5. GenRiver simulation of the Buol watershed under five land-use change scenarios

Box 4: Impacts of agroforestry expansion to watershed functions in Manupali

In the Philippines, the project carried out a GenRiver-model simulation in the three sub-watershed clusters based on four scenarios: current land-use (BAU), expansion of crops, expansion of banana plantations, and agroforestry. The simulation showed that the conversion of 50% of all land cover types except forest and settlement into agroforestry will reduce surface flow and increase subsurface flow and base flow (*Figure 6*).

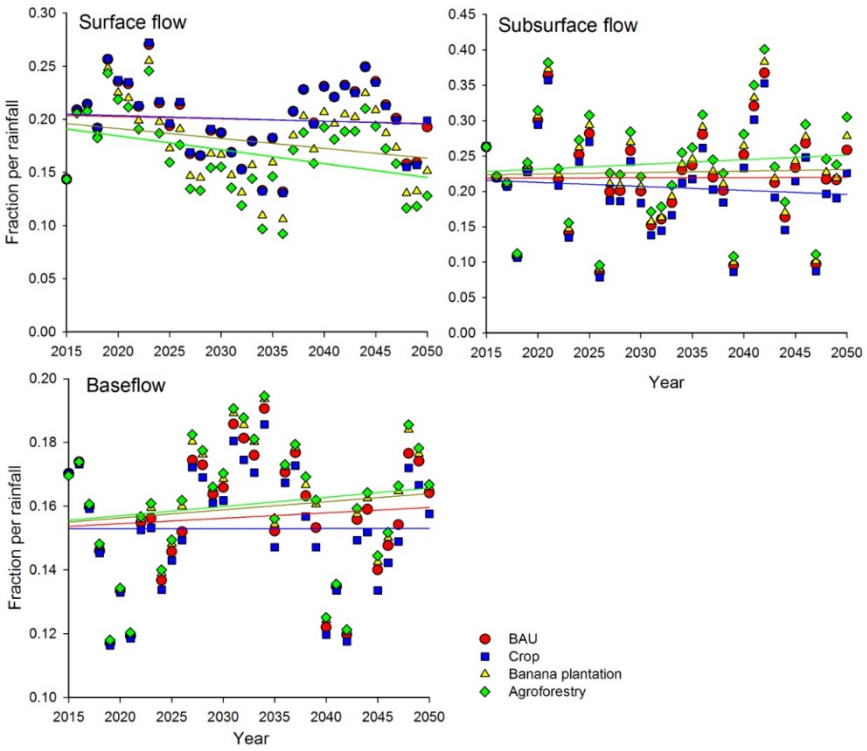

Figure 6. Fraction of river flow components for various scenarios of land cover change in the Tugasan sub-watershed, the Philippines

Additional research

Smart Tree-Invest also adopted participatory visual research techniques using photos (PhotoVoice) and videos to capture farmers' perception of their vulnerability, and monitor the changes in awareness, knowledge and behaviour resulting from the project activities. These techniques provided more nuance and insight in the research results, while the output can also be utilized as communication tools for activities in Component 3.

In addition to the initial vulnerability assessment in year 1, Smart Tree-Invest carried out additional research in years 2 and 3 to further clarify the vulnerability issues that were identified in the project sites. Additional vulnerability assessment activities[3] that were carried out in years 2 and 3 are presented in *Table 5* below.

[3] Further elaboration on these researches have been presented in the Smart Tree-Invest Annual Report Year 2 2015–2016

Table 5. Additional vulnerability assessment in year 2 and year 3

Country	Research in year 2 and year 3
Philippines	• Study on gender roles and responsibility • Hydrological assessment of the three sub-watersheds in Manupali
Indonesia	• Household food security and nutritional status of women and children • Landscape visioning of smallholders • Feasibility of coastal rehabilitation • Additional data collection on biodiversity and agricultural market value-chain • Hydrological assessment
Viet Nam	• Smallholders' dependence on and preferences for tree planting • Community constraints in tree planting • Hydrological assessment of Ho-ho sub-watershed

Outputs delivered

Based on the assessment conducted under Component 1, the project has produced 11 working papers, a synthesis book, and participatory visual research output through PhotoVoice and Video Baseline. The chart below illustrates that all output targets were achieved and exceeded.

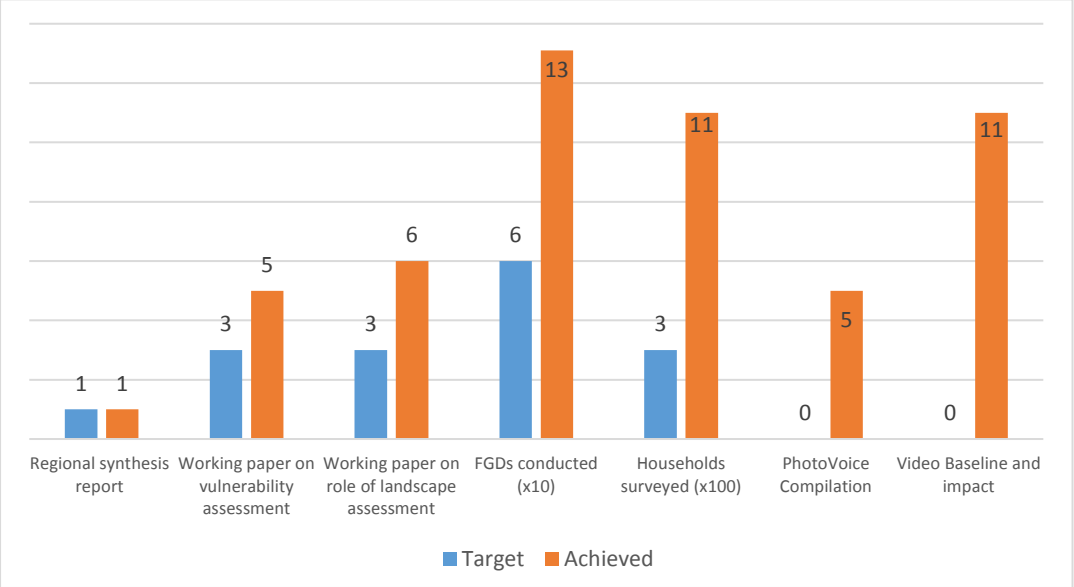

Figure 7. Output from Component 1: Targets and achievements

3.3 Component 2: Co-investment in ecosystem services

Objective: To enable local communities to devise climate-smart, tree-based adaptation practices in collaboration with beneficiaries of the ecosystem services

Main activities

Identification of community constraints

Following the focus-group discussions and household surveys, the project team involved the focus groups in a SWOT (Strength, Weakness, Opportunities, and Threats) analysis to identify community constraints for coping with extreme events such as climate change, natural disaster, and socio-economic and political shocks, then to self-identify their strength and oppportunities for improving their livelihoods. This information was crucial to the design of co-investment schemes and activities as it provided information that was assessed and preferred by the communities.

The SWOT analysis focuses on vulnerability categorized by the status of the five 'livelihoods capitals' of the smallholders in the project site. To widen the perspectives, local government (village and sub-district) representatives were also invited. *Figure 8* shows how SWOT analysis highlights community constraints and opportunities in one of the clusters in Viet Nam.

Strengths

Weaknesses

Opportunities

Threats

Figure 8. Stakeholders' perceptions of strengths, weaknesses, opportunities, and threats in the Huong Lam cluster, Viet Nam (note: bigger fonts represent stronger perceptions, font colour representation of livelihood capital: green = natural; blue = physical; red = financial; orange = social; purple = human)

Establishment of the local multi-stakeholder forum

Smart Tree-Invest aims to both establish, revive, improve capacity of multi-stakeholder forums maconsist of local stakeholders to form a solid foundation for potential co-investment schemes.

In Viet Nam, the project collaborated with the Project Advisory Group in Ha Tinh and Quang Binh Provinces, which consisted of government representatives from the rural development, agricultural, and environmental departments. The Advisory Group helped to design co-investment activities that were then integrated into existing policies and programs.

In Indonesia, Smart Tree-Invest helped establish a district-level watershed working group to promote integrated watershed management in the district. Members of the group included government officers from various sectors related to watershed development, such as planning, environmental, agricultural, public works, and extension offices. The establishment of a multi-sectoral watershed working group in Buol was aligned with the National Government Regulation 37/2012 on watershed management. The regulation requires each district with critical watersheds to establish a multi-sectoral forum to coordinate watershed conservation. The working group obtained political support from the District head. The working group members ultimately championed adoption of the Smart Tree-Invest approach into the district development plan in 2017. The working group's negotiations also led an oil-palm company to co-invest in watershed monitoring activities within their upland plantation area.

Figure 9. Workshop on the establishment of Watershed Working Group in Indonesia (left) and the Philippines (right)

In the Philippines, the project facilitated the revival of the Payments for Ecosystem Services Working Group (PES-WG) for the Manupali watershed. The group, which included the Provincial Government of Bukidnon, the government of Lantapan, the Mindanao Development Authority (MinDA), the Provincial Environment and the Natural Resources Office, the Protected Area Management Board of Mt. Kitangld, and the National Hydropower Company, had been previously inactive for two years. The project also helped PES-WG to conduct their post-project activities and outcome mapping process, to ensure more commitment and activity continuity from the group members. To date, selected members of the group led by the Bukidnon Environment and Natural Resources Officer function as the monitoring body for the co-investment scheme of a farmers' organization in Lantapan.

Capacity strengthening for the local development actors

The project held a series of training activities to enable local development stakeholders, such as the local government, NGOs, and the private sectors, to co-invest in ecosystem services. These activities aimed to improve the knowledge and awareness of local development actors on ecosystem services and the climate-smart, tree-based approach to agriculture.

In the Philippines, capacity building targeted the members of the PES Working Group. It focused on institutional strengthening, including outcome mapping and the concept of co-investment in ecosystem services. Some representatives of the PES working group, including the agricultural technicians of the municipality of Lantapan, participated in the initial farmers' agroforestry training session (Introduction to Agroforestry and Conservation Agriculture with Trees) to familiarize themselves with the various agroforestry systems that the farmers will implement in their farms.

Selected members of the group also participated in negotiation meetings with the fund manager and potential buyers.

In Indonesia, the capacity building combined with game and on-the-ground practices focused on three aspects: (1) integrated watershed management; (2) ecosystem services; and (3) tree-farm management, targeting the Watershed Working Group and rural advisory (extension) officers respectively. In the ecosystem services training, the project shared the comprehensive knowledge on ecosystem services development, which consisted of the practical examples of payment and co-investment of ecosystem services, and the practical methodology to monitor the watershed services, tree diversity, and carbon stock from the trees. The representatives from the CSR unit of an oil-palm plantation company in the district also participated in the training.

Figure 10. Capacity-building activities with the stakeholders. Left: Agroforestry management training for the district extension officers in Indonesia. Right: Outcome mapping workshop with the PES Working Group in the Philippines

In Viet Nam, training for local development stakeholders focused on the Climate-smart Agriculture approach, covering agroforestry development, tree-farm management, and pest and disease control. Local government and IFAD's SRDP staff expressed interest to integrate the Smart Tree-Invest approach into their climate-smart agricultural program. In response, several training sessions were held in October–November 2016 for the Districts' Farmer Union Staff and IFAD SRDP project staff in Ha Tinh Province.

Co-investment schemes

After the scoping period (vulnerability assessment), Smart Tree-Invest only had two years left to prepare the co-investment schemes. The preparation mainly included the institutional preparation through capacity building, awareness raising, and negotiation with potential co-investors: local government and development agencies, the private sector, and local communities in the project sites.

In Viet Nam, at the end of the project, the project successfully initiated a collaboration between the district authorities, development agencies such as IFAD's SRDPP project, and tree-seedling companies that support the smallholders in enriching their home gardens with productive trees, crops and grass.

In Indonesia, the project encouraged the local government, represented by the District Watershed Working Group, and a palm oil company to co-invest in supporting smallholders tree-farming activities and to conduct regular environmental monitoring in the watersheds.

In the Philippines, the project collaborated with the local farmers' organization, an NGO and the local PES working group, as well as government institutions such as the Mindanao Development Authority, to implement a co-investment scheme in the Mount Kitanglad buffer zone. The co-investment scheme aimed to provide incentives for farmers to develop agroforestry in their degraded farm area.

The activities that prepared the co-investment schemes are summarized below.

1. Smallholder tree-management learning group in Buol

From December 2015 to January 2017, Smart Tree-Invest ran smallholder learning group activities in eight village sites in Indonesia, to strengthen the capacity and to empower local smallholders in tree-farm management practices.

The learning group adopted an inclusive and self-determined learning approach, which is different to what currently practised by the district agricultural office. Group members selected the commodities and each was required to contribute, e.g. by providing learning plots, nursery construction materials, or labour. Each group progressed according to the willingness and activeness of its group members. Smart Tree-Invest provided technical assistance, facilitation and any hard-to find materials in the district, such as shading nets and specific plants' seeds.

In intensive meetings (at least twice per month), the project supported the members' capacity to improve farm land productivity with better techniques, including producing high quality tree seedlings, organic fertilizer and organic pesticides. In the long term, this is expected to provide livelihood benefits in the form of additional and more diversified income. The expansion of tree-based agricultural land is also expected to improve ecosystem services.

The initiative involved 240 smallholders (about 30 members/village), including 79 female members across the groups. Seeing the results and potential of this approach, the local government, through their agricultural office, allocated District development fund in 2017 to replicate the initiatives. The fund was used to establish learning groups in 3 villages in adjacent watershed. The project supported the initiative by providing hands-on training to the field agricultural staffs to better understand inclusive approach in advising and increasing the capacity of farmers.

Figure 11. The Learning Group Activities

The project also linked champion members of the learning groups with the Agricultural Office and Village Empowerment Office to become resource persons in future outscaling activities of tree-farm management within the district. The knowledge in producing organic fertilizer has encouraged the farmers to cage their livestock for fertilizer materials, changing the habit of letting livestock roam free in the road and agricultural land.

2. Climate-smart tree-based agriculture in home gardens in Ha Tinh and Quang Binh Provinces

In Viet Nam, the team enriched smallholders' home gardens by introducing agroforestry system combining fruit tree, grass and intercrops, and expected to contribute in to 1) improving local people's food security and nutrition status; 2) ensuring more stable income [4]; and 3) increasing farmer's resilience to extreme weather events through better food security, environmental protection such as wind-break, and income stability. The home-garden scheme empowers all family members: male, females and children in the households as they take turns in managing their yards.

The improved home-garden systems consist of local species that smallholders prefer. Pomelo and orange trees were planted between annual crops, such as beans, peanut, sweet potato, maize and guinea fodder grass. The system was designed collectively between the District DARD, farmers, and the Smart Tree-Invest team (*Figure 12*). At the end of project, 43 households joined the home-garden initiatives.

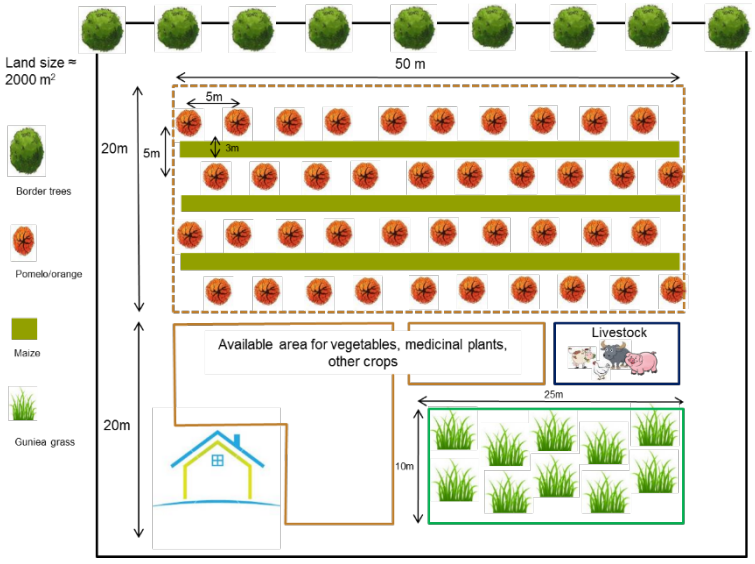

Figure 12. The design of a climate-smart, tree-based home garden of the Smart Tree-Invest project applied in Ha Tinh and Quang Binh provinces

The project had been negotiated with Ho Ho Hydropower Company as a potential co-investor in the watershed. The negotiation raised awareness and interest of the Hydropower Company in conserving the watershed, but for reasons internal to the Company, this activity did not lead to collaboration. However, Viet and Tan Thanh Phong, two tree-seedling companies based in Ha Tinh Province, were interested and became co-investors for the replication. The company provided seedlings to smallholders, and agreed to buy the harvested fruits from the farmers' home gardens. Seeing the promising results of this approach, the local government of Ha Tinh and Quang Binh provinces,

[4] The economic analysis informs a potential additional income of about 16–17 million VND (about USD 800) per year from the agroforestry systems introduced in the 2,000 m² local home gardens.

through local DARD and Commune People Committee, adopted the approach into their regulation as an example of climate-smart agricultural practice.

3. Development of a tree-based agricultural compensation scheme and conservation business case in the Manupali watershed

In the Manupali watershed in the Philippines, the smallholders' farming system is dominated by annual mono-cropping corn, banana and vegetables. This agricultural pattern contributes to soil degradation which affects the condition of the watershed. In response, the project promoted climate-smart, tree-based farming systems that can reduce further soil degradation and riverbank erosion, thus improving smallholders' land quality.

The team communicated with two potential ES providers in the sub-catchment: the Association of Lantapan Sustainable Agro-ecological Zone (ALSA), which has smallholder members in every sub-catchment site, and the organization of the indigenous people that live on the border of Mount Kitanglad National Park. Unfortunately, the indigenous people's organization decided to opt out of the co-investment scheme because they already had several ongoing projects at the time.

To prepare the ALSA smallholders to develop climate-smart, tree-based agriculture, the project held workshops on sustainable and climate-smart farming systems in Claveria, Bukidnon in July 2015 and in Lantapan in January 2017. The workshops involved 80 potential farmers who were interested in enriching their cropland with tree-based commodities such as cacao, coffee and rubber.

The project originally intended to follow up with a pilot compensation scheme for farmers who manage to enrich their lands. However, as preparations took longer than expected, particularly in the awareness-raising and capacity-building processes, the project could not secure a long-term contract with the smallholders. Instead, Smart Tree-Invest collaboration with ALSA will continue through KIN, a local NGO that has been working in the Manupali watershed since the 1990s and involved in the Smart Tree-Invest activities since 2016.

In the compensation scheme contract that requires farmers to adopt tree-based agriculture on their monocropping lands, KIN will act as the co-investment intermediary that will manage the seed fund for the scheme. ICRAF provided USD 6,000 as the seed fund for the co-investment scheme in Manupali. The Letter of Agreement between ICRAF and KIN as fund manager of the co-investment scheme was signed on 19 April 2017. This formalized the transfer of the seed fund from ICRAF to KIN to be used for the initial co-investment activities by ALSA, specifically for the establishment of a tree nursery and for training farmers in sustainable tree-based farming systems. At the end of the project, 61 ALSA farmers committed at least 100 ha of farmland, about 55 ha whereof was validated and geotagged.

KIN will collaborate with the PES Working Group that will act as a multi-stakeholder monitoring body for the co-investment scheme. MinDA expressed their interest to add funds for the co-investment with ALSA in the Manupali watershed from their PES program budget. MinDA has already supported another PES scheme in Mount Kalatungan, another conservation area in Mindanao, and they are interested to expand the program through the co-investment in Manupali.

4. Promoting climate-smart, tree-based agriculture on degraded sloping land in Quang Binh Province

The planned forest enrichment and reforestation were cancelled because the farmers wanted to plant the area with acacia tree instead of the native trees. However, the team managed to continue the enrichment of the sloping land.

The scheme aimed to mitigate erosion and run-off through agroforestry practices with trees, crops and *Guinea Mombasa* grass. Until the end, the project managed to involve three households from two villages. The challenge was that the degraded areas were far from the settlement, and the project needed to involve more smallholders in the proposed schemes.

Figure 13. Degraded sloping land in Viet Nam

The co-investment schemes initiated throughout the project are summarized in the table below.

Table 6. Smart Tree-Invest' co-investment schemes, targeted ecosystem services, and co-investors

Country	Co-investment activities	Targeted Ecosystem services*	Collaborators (co-investors), beneficiaries
Indonesia	• Tree-nursery and farming management learning group • Participatory watershed monitoring • Tree growth monitoring for restoration programs	Water yield WY1: Restoring vegetation-level water use and subsurface and surface flows Controlling sediment load of rivers WS7: Protecting river banks, riparian zones and landslide-prone slopes	*Co-investors:* • Buol Watershed Working Group *(coordinator)* • Public development fund from: • District Agriculture Office • District Environment Office • Planning Office • Village government • CSR from the oil-palm plantation company for watershed monitoring *Beneficiaries:* • 240 smallholder members of the Smart Tree-Invest tree-farm learning group • ±90 smallholder members of the replication of tree-farm learning group (using public district and village funds) in the Mulat-Lantika Digo watershed • Public sector (village and district government)
Philippines	• Adoption of tree-based farming on monoculture cropland • Establishment of community tree-nursery	Water yield WY1: Restoring vegetation-level water use and subsurface and surface flows Flow pattern of blue water WF5: Modifying operating rules for reservoirs and hydropower schemes	*Co-investors:* • ICRAF (*seed fund*) • KIN (*intermediary, fund manager*) • Manupali PES Working Group *(monitoring body)* • Mindanao Development Authority *(potential co-investors)* *Beneficiaries:* • 61 smallholders that committed to join under the ALSA farmers organization • NAPOCOR and plantation companies operating in the watershed *(potential beneficiaries and co-investors)*

Country	Co-investment activities	Targeted Ecosystem services*	Collaborators (co-investors), beneficiaries
Viet Nam	• Home garden improvement with Climate-Smart Agriculture (CSA) approach • Agroforestry development in sloping land	Water yield WY1: Restoring vegetation-level water use and subsurface and surface flows Flow pattern of blue water WF4: Increasing rainfall infiltration, maximizing use of slow-release groundwater pathways, reducing flood volume and duration (increased flow persistence) WF5: Modifying operating rules for reservoirs and hydropower schemes	*Co-investors:* • IFAD's SRDP project in Ha Tinh • Tree seedling companies in Ha Tinh province • New rural development program with the Commune People Committee in Ha Tinh and Quang Binh provinces *Beneficiaries:* • 43 households (86 male and female smallholders) that participated in the CSA home-garden approach • Three households (six male and female smallholders) involved in agroforestry practices on sloping land • 17 households as a part of CSA home-garden and sloping-land agroforestry replication supported by tree seedling companies and the Local People Committee • 161 households in Ha Tinh voluntarily adopted the project's CSA home-garden and sloping-land agroforestry approach • Local DARD and other CSA practitioners • Ho Ho Hydropower Company (*potential beneficiary and co-investor*)

* Prototype refers to Annex 5

Outputs delivered

Based on the activities under Component 2, the project analysed community constraints and potential (SWOT), established a multi-stakeholder forum in each site, organized capacity building activities for stakeholders in the project sites and initiated the co-investment schemes that provided smallholders with access to the adaptation fund. The chart below illustrates that all output targets were achieved and some even exceeded.

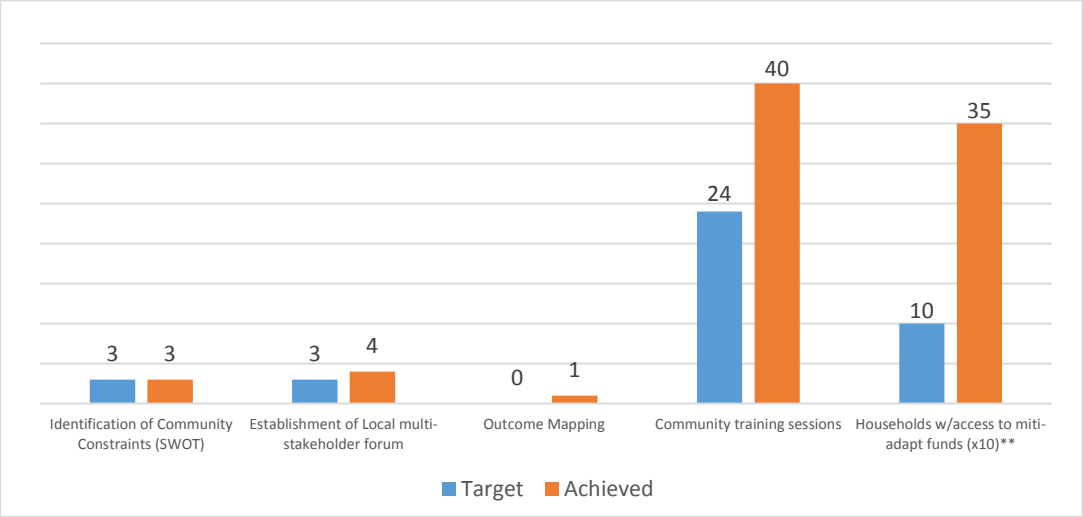

Figure 14. Output from Component 2: Targets and Achievements

3.4 Component 3: Mitigation and adaptation strategies for local and national public and private sectors

Objective: To integrate gender-responsive, culture-sensitive climate change mitigation and adaptation actions that improve livelihoods for smallholding farmers into mainstream policy and programs.

Main activities

Communicate programs and lessons learnt to stakeholders through events

Smart Tree-Invest developed several communication products and actively promoted the project through various regional and local events, both as organizer and participant. In April 2014, Smart Tree-Invest organized a project inception workshop in Cebu, Philippines. The workshop aimed to consolidate the project team and captured the expectations of the national stakeholders, IFAD country officers, and IFAD loan project representatives (READ, INREMP, and SRDP) from Indonesia, Viet Nam, and the Philippines.

At the regional level, the project participated in the IFAD Asia Pacific Meeting 2015 in Bali, Indonesia, organized a session called *Co-investment in Ecosystem Services* at the first Asian ES-Partnership Conference 2016 in Ansan, South Korea, and participated in the ADB Food Security Forum 2016 in Manila. A regional closing workshop held in Jakarta in May 2017 was attended by the local and national government representatives and development organizations, including IFAD, from the three countries.

Throughout the project, the Smart Tree-Invest team conducted the national, provincial, and district meetings in each site in order to mainstream the project approach and mission to a wide-range of stakeholders, including the private sector. In the beginning of the project (May–June 2014), Smart Tree-Invest organized an inception meeting at site level, at which the team recorded the expectations of stakeholders in the project. When the local closing workshops were held around March–April 2017, the project captured the stakeholders' satisfaction with the project approach and impacts.

In each site, the project carried out regular meetings with local stakeholders to report on the progress and to consolidate the activity plan. The project also communicated and mainstreamed the project to the provincial and national workshops.

In Viet Nam, the planning and consultation meeting with the Project Advisory Group was held bi-annually in Ha Tinh and Quang Binh Provinces. The Smart Tree-Invest team actively participated in the regular National Climate Change Working Group meetings and presented information to the group about the project's approach and activities in Ha Tinh and Quang Binh.

In the Philippines, the project team regularly participated in the annual IFAD Knowledge Management Market event along with national government and development agencies. At the end of project, the Philippine branch organized the Water Users Forum to present the project output and the co-investment business case to local stakeholders and potential investors. The team also organized a policy forum to share progress and achievements from the pilot to other development agencies, government organizations, academia, donor agencies, and the private sector.

In Indonesia, the project organized an annual district-level workshop to report on the progress and consult the workplan for the upcoming year. In 2016, the project exhibited at the two-week Buol District Development Exhibition event, and gained the interest and awareness from many smallholders that lived outside of the project site. Since the exhibition, smallholders from other villages began visiting the project office in Buol District.

In February 2017, the project organized a provincial workshop at the Central Sulawesi Governor's office, to share the lessons learnt from the project in the district. At the national level, the project organized a national workshop with the Indonesian Science Institute to introduce the project to the national stakeholders and media. Further, the workshop provided insights on how to align the newly enacted Village Fund policy with the co-investment activities.

Production of communication materials and business case

To mainstream the results, the project produced various communication materials, such as poster, flyers, roll-banners and video, and shared flash drives with the project publication and communication materials at various development events and exhibitions.

To guide local stakeholders to implement their own co-investment in ecosystem services schemes, the Smart Tree-Invest country teams developed business cases, policy briefs, and manuals of the project activities. These guidelines are based on the context and characteristics of the project sites, and are expected to secure continuity of the activities after the project concludes.

The project team reported most of the activities through articles that were shared through the project blog[5] and other media. The project communication team produced baseline video and PhotoVoice at the beginning and the end of project. The first video and PhotoVoice focused on farmers'

[5] http://www.worldagroforestry.org/project/smart-tree-invest/news

perceptions of their potential and the challenge facing them. The final PhotoVoice and video covered the changes achieved or helped through the project activities. Unfortunately, increasing security concerns in Minandao in 2017 prevented the team from producing the final PhotoVoice and video on the project impact in the Philippines. Yet, by the end of the project, Smart Tree-Invest managed to produce 5 PhotoVoices and more than 10 videos, including one report from local television in Ha Tinh, Viet Nam.

Figure 15. The project exhibitions at various events: regional closing workshop, country closing workshop, ADB forum, Bali forum.

In collaboration with the stakeholders, Smart Tree-Invest developed business cases for conservation and rural development, aimed at providing a negotiation basis for smallholders and aspiring co-investors in conservation and rural development activities.

The Philippine business case was developed in conjunction with the PES Working Group and ALSA, which focused on various aspects of rural development and conservation strengthening, such as environment, livelihoods, health and sanitation. The business case included conditionality indicators, budget estimations and potential implementation areas to better negotiate activities and compensation with the potential co-investors.

In Indonesia, the business cases aimed to provide local stakeholders with practical guidelines on the replication of project activities, including the various steps, budget estimations, and potential areas for implementation. The business cases covered activities related to improved smallholder livelihoods (farmer learning groups) and ecosystem services (watershed monitoring and tree-growth monitoring for restoration/rehabilitation projects).

The Indonesian team also provided the Buol village governments with technical guidelines to utilize the Village Fund for agricultural and environmental development activities. At least two village governments in Buol have since done so.

In Viet Nam, the project developed several guidelines on the climate-smart agriculture approach in home gardens and on sloping land. Smart Tree-Invest presented the profitability analysis and environmental benefits and trade-offs for home gardens and sloping land.

Outputs delivered

The project has developed more advocacy and communication material (poster PhotoVoice, technical guidelines, posters etc.) to mainstream gender-responsive, climate-smart and tree-based mitigation and adaptation into local and national policies and programs. *Figure 16* shows the output achieved in this component; the list of produced and published communication materials is attached in *Appendix 1*.

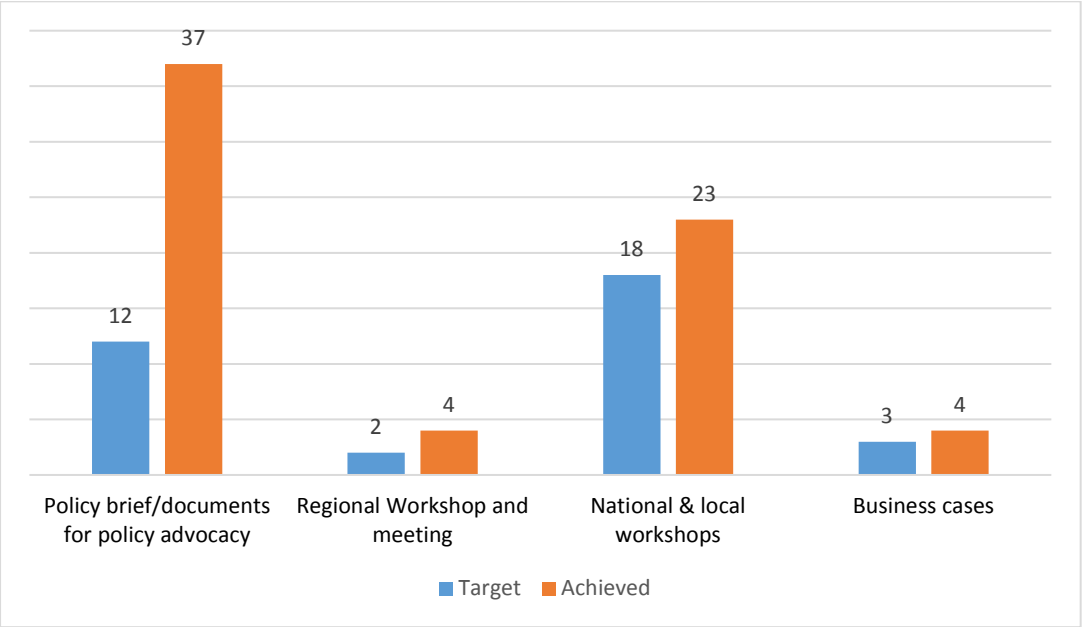

Figure 16. Component 3: Output targets and achievements

3.5 Assessment of effectiveness in achieving component objectives

The summary of achievements can be seen in *Table 1* and *Table 2* in *Section 3.1*. They are elaborated per component in *Figures 6*, *14* and *16*. In each component, the project successfully delivered on, and in some cases even exceeded, the expected outputs. The project team immediately identified new research opportunities at the start of the project and has been exploring and developing new research topics throughout the project. The project's funding from the World Agroforestry Centre's Core Research Program also helped to expand the research activities.

4. Assessment of impact and of impact attribution

Through capacity building and empowerment, the Smart Tree-Invest project activities contributed to IFAD's fifth Strategic Objectives that will guid IFAD's operations over the 2016-2025 period: SO1 (Increase poor rural people's productive capacities) and SO3 (Strengthen the environmental sustainability and climate resilience of poor rural people's economic activities).

The project provided smallholders with skills and knowledge on tree-based farming and agroforestry practices: tree-farm management in Indonesia, home-garden enrichment in Viet Nam, and enrichment of monocropping land with agroforestry in the Philippines. In the long-term, these activities are expected to provide livelihood benefits for smallholders by increasing farm productivity, diversifying income sources, and providing additional income from the production of seedlings and organic fertilizer.

The project organized activities for local development actors to build their capacity to facilitate rural agriculture and conservation activities. The increased capacity of the local government is expected to bring positive impacts to the rural people and development, particularly with respects to agricultural productivity and environmental conservation.

At the end of the project, the learning group members in Indonesia voluntarily planted 4,500 cacao, durian and nutmeg trees in their private and degraded lands. The expansion of tree-based agricultural land will help improve ecosystem services such as carbon sequestration, water cycle, and protection from strong winds and floods. The improved livelihood and environmental quality will help increase the resilience of the smallholders in the project sites.

The project results are linked with IFAD's expected outcomes (2016-2025), particularly with Outcome 2 (Increased level of investment in the rural sector); and Outcome 3 (Improved country-level capacity for rural policy and programme development, implementation and evaluation).

In the Philippines, the co-investment approach made stakeholders aware that smallholders and other actors also have various (financial and non-financial) means to contribute to the conservation effort.

In Indonesia, the project provided a practical example on how to utilize the Village Fund for rural development. Owing to limited capacity and knowledge, many village governments in Indonesia mostly focused on developing their infrastructure to comply with the newly enacted Village Fund policy. Smart Tree-Invest inspired the village governments in Buol to utilize their village development funds for agricultural and conservation development. This contributes in achieving Outcome 3 (Improved country-level capacity for rural policy and programme development, implementation and evaluation) as the Village Fund scheme under the Village Law number 6/2016 has not been fully utilized its potential to achieve green rural development goal.

Local government in Viet Nam understood that the project's home-garden agroforestry scheme, which brought livelihood and resilience benefits, is aligned with and a practical example of the local climate-smart agriculture policy. The promising results from home gardens drew the interest of the private sector in supporting farmers to implement the scheme. The home-garden scheme also brought the opportunity to empower women and youth in agricultural development. Local government has therefore begun replicating and upscaling this approach to comply with their climate-smart agriculture regulation.

The project co-investment schemes were aligned with IFAD's five principles of engagement that Smart Tree-Invest: (1) targeted the marginalized and poor smallholders; (2) empowered female and male smallholders; (3) tested innovative approaches and methods through the co-investment schemes; (4) required learning from the smallholders and the landscape, and (5) promoted the scaling-up. In addition, to achieve the project goals, the project developed networks and partnerships with stakeholders from various levels and sectors of governance. As an action research project, Smart Tree-Invest designed and implemented its co-investment activities based on knowledge garnered from landscape and community, disseminated this knowledge throughout the project phases, and strengthened the institutional capacity of the actors required to support the co-investment.

5. Assessment of grant management and partners' performance

As a multi-country project, applying methods consistently proved challenging. In addition, the capacities of the project researchers and partners varied, further complicated by language barriers between countries and sites. The regional team has used all means of communications available, such as email and Skype, and held three regional meetings, including two regional training sessions in years 1 and 2, to improve internal coordination between the regional and country teams.

The regional project leader, assisted by a regional project officer, closely supervised the research and co-investment activities in each country. The project officer compiled the annual plans and evaluated the progress of each country. Regional coordination was done via email and web conferencing.

Held at least once a year, regional meetings were opportunities for sharing information and progress and further build the capacity of the researchers. In the first year, the regional inception meeting was complemented with a training in the CaSAVA framework. In the second year, several regional meetings for Smart Tree-invest were held: the STI Regional Outcome Mapping Training in Ha Noi, Viet Nam in March 2015, the meeting with country research officers in the ICRAF SEA Office in June 2015, and at the ICRAF Science Week in September 2015.

In the final year, the consultation meeting with the country teams was held in South Korea in May 2016, and another session after ICRAF's global Science Week in Nairobi in September 2016. After having been postponed several times, the project's Supervision Mission was finally held in Manila and Lantapan in June 2016, directly after the ADB Food Security Forum. Fabrizio Bresciani, the project Grant Manager, and Omer Zafar, the Philippines Programme Manager from IFAD Asia Pacific, participated in the Supervision Mission meeting.

Smart Tree-Invest initiated the intensive collaboration with partners, such as the multi-stakeholder forum, private sector, and local NGOs, in Years 2 and 3. The collaboration consisted mainly of capacity building for partners. The impact will be discussed in the following sections (*Sections 7* and *8*).

6. Innovation, Replication and Upscaling

6.1 Innovation

Smart Tree-Invest generated several innovations: the co-investment in ecosystem services scheme, research into local contexts to design the scheme, simple but effective methodologies for participatory research and co-investment, and establishing multi-sectoral collaboration with local stakeholders. Smart-Tree-Invest combined all these aspects in developing its pilot.

Co-investment in ecosystem services scheme

The co-investment model applied in Smart Tree-Invest is an evolution of the concept of payments for ecosystem services. 'Co-investment' means that parties interested in a particular landscape get involved in, contribute to schemes by jointly investing financially and in-kind, that will improve the resilience its smallholders and environmental health. Instead of 'payments', which connotes market transactions between users and sellers, the term 'co-investment' allows more flexibility for the parties that want to engage in the environmental stewardship. In this case, strong commitment and trust among parties become important elements to ensure the sustainability of the joint investment.

The project had prepared several co-investment schemes in the project sites, namely *Adoption of agroforestry in mono-cropping land* (Philippines); *Tree-farm management learning group*, *Participatory watershed monitoring*, *Tree growth monitoring* (Indonesia); and *Home garden and sloping land improvement with Climate-Smart Agriculture approach* (Viet Nam). These schemes were built on local strength and potential (i.e. used local seedlings, re-introduced native commodities, and created market opportunities to improve smallholders' livelihoods and landscape quality).

Research into local contexts and combining local and scientific knowledge to design the co-investment scheme

Smart Tree-Invest adopts the CaSAVA framework to ensure comprehensive understanding of the smallholders' vulnerability. CaSAVA not only assesses vulnerability and resilience but also strengthens capacity in the process by encouraging smallholders to reflect on local conditions and explore collaborative solutions. The CaSAVA framework enabled the team to combine local knowledge with scientific knowledge such as remote sensing and ecological modelling. The combination proved useful in making appropriate recommendations for activities that could reduce smallholder vulnerability and improve the landscape's environmental quality.

After obtaining the results from the vulnerability assessments, the project carried out additional research on local issues to further clarify the site-specific vulnerability context. The additional studies covered a wide range of topics such as hydrological modelling and gender in the Philippines, constraints in planting trees and ecological modelling in Viet Nam, and food security, nutrition, market value chain, watershed monitoring, landscape visioning, and coastal rehabilitation feasibility in Indonesia (See *Section 3.2.3*).

Simple and reliable methodologies using a participatory approach to research and co-investment

Throughout the research and co-investment activities, the project developed simple methods that can be utilized by the community with relatively low cost and are relatively easy to apply. In the participatory watershed monitoring activity, the project built the measure tools, such as the socchi disk (to measure water quality) and rainfall stations from generic materials that can be easily found in

local markets. The local community was involved in the participatory watershed monitoring data collection.

Based on the hydrological assessment in Buol, the project developed a Watershed Game to raise community awareness on the condition of their watershed. The Watershed Game was played with the local community in the villages during the consultation meetings and with Buol Watershed Working Group members during the training on ecosystem services. The feedback afterward was positive, and participants felt the game reflected their everyday situations.

Building on the understanding of local strength and vulnerability, the project explored specific schemes that made use of local potential. The project also integrated farmers' commodity preferences as long as they fit in with the landscape. The co-investment schemes in Viet Nam were developed after considering the zoning regulation that limited the potential area for tree-based agriculture, the degraded land surrounding the house, and after looking at the potential of local orange and pomelo trees to be cultivated as income and resilience sources for farmers. The tree-farm learning group in Indonesia stepped up the use of local seedlings, with communities becoming the main drivers of progress.

Smart Tree-Invest used a participatory visual approach to assess impact as well as for communication purposes, deploying PhotoVoice and videography to explore project site conditions from local perspectives. These forms of participatory action research enable farmers to express their perspectives through creative media that can also be used for a wide range of purposes, from contributing data (baseline and activity impact) to providing evidence for decision makers.

Collaboration through multi-stakeholder forums, including the private sector

Smart Tree-Invest facilitated the establishment of working groups in the project sites, which consisted of local government and non-government representatives from various development sectors. The government representatives consisted hailed from various departments: agriculture, environment and planning. In the Philippines, the non-government actors that were involved included the private sector, such as NAPOCOR hydropower, and civil organizations such as Indigenous People, and the Binahon Agroforestry Farm (BAFF) that have interests in conservation and agricultural development in the watershed.

The multi-sectoral working groups strengthened the coordination and collaboration required to support the co-investment schemes. Each country's working group is expected to act as intermediaries for the co-investment, to monitor and supervise the activities (i.e. watershed monitoring and tree-planting), to bridge the interest between smallholders and the other co-investors, and to endorse the policies required to support and maintain the long-term sustainability of the scheme. In Indonesia and Viet Nam, where all working group members were government officers, the working group helped to raise awareness and draw interest from the private-sector actors to co-invest: an oil-palm company in Indonesia, and a tree seedling company and a hydropower company in Viet Nam.

6.2 Replication and Upscaling

The initial results from the project implementation have encouraged the local government to adopt the approach and methods into local development activities.

KIN, the seed fund manager for the co-investment scheme in the Philippines, has been working in the Manupali watershed for two decades. There is potential to engage KIN's existing partners in the co-investment scheme, from the community and Indigenous People (IP) group and from their

government networks. Through the Policy Forum, the Mindanao Development Authority (MinDA) has expressed interest in allocating USD 6,000 to support the co-investment schemes initiated by the project in Manupali. However, this agenda may take some time to be enacted.

In Buol, Indonesia, the local government adopted the co-investment principle in the upcoming district regulations on CSR and the Village Fund. The district also replicated several project activities using the district's development budget of about USD 27,000 in 2017. The replications have been carried out in the Mulat-Lantika Digo watershed, the second-biggest watershed in the district. It involved three villages and 90 smallholders in the tree-farm learning group, 4 hectares of restoration land for tree-growth monitoring, and five measurement points in the upstream and midstream watershed area for participatory watershed monitoring.

At village level, two villages from the cluster sites (1 midstream and 1 coastal) replicated the tree-farm management activities using their village development fund.

The Buol Watershed Working Group successfully persuaded the oil-palm company to co-invest. At the end of the project, the oil-palm company built and installed several watershed monitoring tools in the upland within their plantation area, and adopted the project's tree-growth monitoring techniques in their own rehabilitation program. The collected data will be compiled and reported periodically to the environmental office.

In Viet Nam, the project pilot models provided a practical example of climate-smart, tree-based agriculture systems for rural development. The best practices were officially adopted and scaled up by the local decision-makers. SRDP, an IFAD loan project in Ha Tinh Province, also integrated the climate-smart agriculture approach in their own program. At the local level, up until March 2017, the local People' Committee with DARD in Ha Tinh and Quang Binh Provinces supported the replication of this scheme in an additional 17 households under the New Rural Development Programme initiative. The DARD officer in Ha Tinh reported that 161 non-participant households in the project site have voluntarily adopted the project's CSA home-garden and sloping-land agroforestry approach.

7. Sustainability

Smart Tree-Invest adopted several strategies to maintain the sustainability of activities after the project finished. One is working with and strengthening the capacity of the multi-stakeholder forum (working groups) and local NGOs/development projects to continue the facilitation and implementation of the co-investment scheme. The other is linking the project approach and methods with the development regulation, policies, and programs at a local and national level.

In Viet Nam, the district and provincial Departments of Agricultural and Rural Development are carrying out the replication. Through capacity building and monitoring sessions, the project shared knowledge with local government, providing them with guidelines to apply climate-smart tree-based agriculture.

In terms of policy, the district governments in Ha Tinh and Quang Binh integrated the home-garden and sloping-land scheme into the several local District Decisions:

- Decision No. 71/QD-HDND on the Expansion of the Coverage of the Home-garden Policy in Huong Khe District of Ha Tinh Province
- Decision No. 735/QD-UBND on Funding Support for Pilot Models of Home Gardens in Tuyen Hoa District, Quang Binh Province

The provincial governments of Ha Tinh and Quang Binh Provinces integrated the home-garden and sloping-land replanting activities into their development strategies as a part of climate-smart agriculture approach. This led to the following national policy decisions:

- Decision No. 819/2016 on Program 135 and the New Rural Development Program, the Local Agricultural Restructuring Program, and particularly on the CSA implementation as a practical example of climate-change mitigation and adaptation
- Decision No. 923/MARD/2017 on Green Agricultural Development

From the non-government sector, SRDP, an IFAD loan project in Ha Tinh Province, adopted the Smart Tree-Invest home-garden approach in its climate-smart agricultural activities. In July 2017, Smart Tree-Invest was providing continuing technical assistance to SRDP in reviewing smallholders' proposals to the home-garden scheme. Collaboration between ICRAF and IFAD in Ha Tinh post Smart Tree-invest is being negotiated at the time of writing.

In the Philippines, the project worked closely with the PES Working Group, and strengthened the capacity of Kitanglad Integrated NGO (KIN), a local NGO, as the fund manager of the co-investment scheme. KIN will continue the pilot co-investment scheme and act as the fund manager for the upcoming co-investment scheme with farmers from the ALSA farmers' group. KIN will receive support from the PES Working Group, who will monitor and verify the performance of farmers who join the co-investment scheme bi-annually.

Together with the ALSA farmers, the project facilitated the development of the smallholders' business case on ES and livelihoods. Smart Tree-Invest also connected the smallholders and the PES Working Group to potential buyers through a National Policy Forum organized by the project in Manila in April 2017. Smart Tree-Invest integrated the co-investment and climate-smart agriculture approach into local policy in Lantapan Municipality. Under Resolution No. 2017-067, titled *A Resolution Adopting the Co-Investment Scheme as a Sustainable Financing Mechanism for the Management of the Manupali Watershed through the Adoption of Climate-Smart, Tree-Based Farming Practices*, the Lantapan

Municipal Government acknowledged and supported the co-investment activities of the ALSA farmer group through tree-based farming practices.

In Indonesia, the Watershed Working Group coordinated all replication activities, while the District's Environmental Office remained in charge of implementing the tree-growth monitoring and participatory watershed monitoring, and the District's Agricultural Office of implementing the tree-farm management learning group. The replication activities have been funded through the district's development fund in 2017 and were officially integrated into the district's annual development plan.

Prior to the replication, a series of training sessions was organized for local government officers to improve their knowledge and understanding of the project's approach and methods. Technical guidelines for activity replication have been published and distributed to the local stakeholders.

Seeing the project results, the local government engaged the private sector (such as the oil-palm company) and village governments (through the Village Fund) in the co-investment scheme. From the discussion with the district's high-level policymakers (the *Bupati* or District Chief, the Planning Office Chief, and the Public Work Office Chief) during the Smart Tree-Invest regional workshop in May 2017, the Chief stated that the *Peraturan Bupati* (the District Chief's Resolution) on Village Fund in 2017 will commit 1% of the Village Fund to conservation. The Bupati of Buol also stated that the upcoming District Regulation on CSR will obligate the private sector to co-invest in conservation activities, and enact a regulation to endorse integrated watershed management. These actions were inspired by the Smart Tree-Invest project.

8. Conclusions and Lessons Learnt

Throughout the implementation, Smart Tree-Invest encountered challenges and attained several achievements. While implementing the project, the team learned the following lessons:

- The understanding of local characteristics and needs, from the landscape's, people's, and policy-makers' perspectives, is a compulsory stage prior to the design of co-investment activities.
- Understanding and knowledge can be gathered by combining scientific study with participatory research that acknowledges local wisdom, perspectives and preferences. This includes the understanding of local policy that may influence smallholders' livelihoods and the condition of the landscape.
- While designing the activities, the project should consider economic, social, environmental and gender aspects to involve all groups of stakeholders, including women, and capture their needs.
- Simple methodologies increase the ease of adoption by stakeholders, both in the research and co-investment approach.
- Reliable data is not always available, particularly for ecological modelling. Therefore, an action research project needs to adopt simple methods for data collection, such as participatory monitoring, which has the added benefit of raising community awareness.
- Promising initial results from pilot activities that work and are beneficial for both smallholders and the environment help convince and encourage stakeholders to adopt the project methods and approach.
- Securing multi-stakeholder support is essential to ensure the success of both the research and action components of the project. It must be done in parallel with the capacity-building activities to ensure that local stakeholders have the knowledge and capacity to implement and replicate the project approach.
- Developing CIS schemes takes time. In a relatively short project like Smart Tree-Invest, the team must focus on preparing an enabling environment for the stakeholders to implement the co-investment. Based on the project needs, such preparation may involve capacity building and awareness raising for all stakeholders from the farm to the district level.
- Public and private funds can be considered potential sources for the incentives or rewards for the CIS scheme. This is not limited to funding, but also includes in-kind contributions and commitments from the public and private sectors to the efforts to conserve the environment and improve smallholders' livelihoods.

9. Major Lessons for IFAD

Smart Tree-Invest linked its activities with the current and emerging development policies, issues, and programs in the project sites. The majority of these policies are related to the global development agenda, such as the sustainable development goals, climate-change mitigation and adaptation, and green-growth development.

Across the three countries, the project saw potential to promote and integrate the co-investment scheme (CIS) as one of the strategies to achieve the goals set out in these environmental development policies. The project therefore advocates mainstreaming the CIS concept as it provides a new way to involve stakeholders in environmental stewardship, not only through financial incentives but also through other measures that can benefit smallholders and maintain the quality of environment.

The project also sees the potential to improve land-use planning decisions with a combination of biophysical and participatory research. The collaboration between the development agents and the private sector and cross-sectoral synergy between development agencies (i.e. between agricultural/economic development sectors and the environmental sector) remain technical issues that need to be improved in all sites.

In the Philippines, Smart Tree-Invest provides best practices for the development of co-investment schemes that can be aligned with the ongoing INREMP and upcoming RAPID IFAD loan projects in the Philippines. The project also refers to the involvement of actors in a sustainable financing mechanism for conservation through the co-investment scheme being implemented in Lantapan. In the Philippines, the stakeholders expressed interest to see how the CIS can be applied in different landscapes, such as in coastal and more urbanized areas.

For Indonesia's development context, the project provides on-the-ground examples on how to integrate green perspectives in the new Village Fund regulation in Indonesia. In particular, the project provides one practical example on how to develop a co-investment in ecosystem services scheme, which is aligned with the Economic Instruments regulation under the national Law on Environmental Management. The project also provides best institutional and technical practices for integrated watershed management and the improvement of smallholder livelihoods through tree-based agriculture. The lessons and experiences can serve as input for the design of READ phase II, the upcoming IFAD loan project in Indonesia.

One challenge emerging in Indonesia is how to advocate the use of the Village Fund for environmental conservation at the national level. At the local level, there is potential to improve smallholder livelihoods through several efforts, such as enhancing smallholders' food security, markets and value-chains, and equip them with farm entrepreneurship skills.

The project pilot models provided on-the-ground evidence for Viet Nam's agricultural policies both at the local and national level, particularly for the New Rural Development and Agricultural Restructuring Program, and for the application of the National Decisions No. 819/MARD/2016 on the CSA and No. 923/MARD/2017 on Green Growth. The project also provides practical examples of climate-smart agriculture for IFAD's SRDP project.

Furthermore, the experiences in facilitating the co-investment in ecosystem services scheme in Ha Tinh and Quang Binh hold lessons to improve existing national Payment for Forest Ecosystem Services policy under the National Forest Protection and Development Law that is currently being reviewed.

Table 7 below summarizes the global and national development regulations, issues and programs that are aligned with the Smart Tree-Invest project.

Table 7. Global and National development issues, policies, and programs aligned with Smart Tree-Invest's activities

Country	Indonesia	Viet Nam	The Philippines
Global development issues/policies	Sustainable Development Goals Climate change adaptation and mitigation Green growth		
National development issues/policies/programs	Payment/co-investment in ecosystem services as one of the Economic Instruments for conservation (Law 32/2009 on Environmental Management) Village fund (Law 6/2014 on Village) Agricultural extension system & agricultural development (Law 16/2006 on Extension) Integrated watershed management (Government Regulation 37/2012 on Watershed Management) Corporate Social responsibility	Payment/co-investment in Forest ecosystem services (Revision of Law on Forest Protection and Development 2004) Climate-smart agriculture for climate-change adaptation and mitigation (Decision No. 819/MARD/2016) New Rural Development Program Agricultural Restructuring program	Payment/co-investment in ecosystem services (proposed Administrative Order on Payment for Ecosystem Services) Agricultural development Climate change adaptation (Climate Change Act 2009 RA 9279)
IFAD loan project(s)	Upcoming READ project Phase II (READ in Sulawesi)	Ongoing SRDP project in Ha Tinh	Ongoing INREMP project in Mindanao Upcoming RAPID project

10. Annexes

1. Smart Tree-Invest project communication and awareness-raising materials

No	Topic/Title	Year	Language	URL
Policy Brief and Technical Guidelines				
1	Potensi Kolaborasi Smart Tree-Invest dan Pokja DAS Bumi Pogogul di Kabupaten Buol	2015	English	Available
2	Reflecting on Buol: Lessons learnt from STI implementation progress	2016	English	Available
3	How to recognize and prevent disease on citrus trees poster (in Vietnamese language)	2017	Vietnamese	Available
4	What prevents tree planting in Viet Nam?	2016	Vietnamese	Available
5	*Panduan teknis pengukuran debit sungai sederhana* (Technical guideline on community-based river debit monitoring)	2017	Indonesian	Available
6	*Panduan teknis pengukuran tingkat kekeruhan air dan sediment* (Technical guidelines on the measurement of sedimentation and turbidity)	2017	Indonesian	Available
7	*Seleksi komoditas prioritas* (Community-based commodity selection for tree-farm learning group)	2017	Indonesian	Available
8	Kelompok belajar pembibitan dan pengelolaan kebun (Tree-farm nursery and management learning group)	2017	Indonesian	Available
9	Analisis dan rekomendasi teknis rehabilitasi mangrove (Technical guideline on mangrove rehabilitation)	2017	Indonesian	Available
10	Panduan teknis pemantauan curah hujan sederhana (Technical guideline on community-based rainfall monitoring)	2017	Indonesian	Available
11	Pemantauan dan Evaluasi Pertumbuhan Pohon untuk Program Rehabilitasi dan Restorasi (Technical guidelines on community-based tree-growth monitoring for tree restoration and rehabilitation program)	2017	Indonesian	Available
Kiprah Agroforestri Magazine (newsletter in Indonesian)				
1	Para Petani dan Penyandang Dana Perlu Membuka Mata Mereka akan Besarnya Manfaat Bentang Lahan yang Terintegrasi (vol.8 no.3)	2015	Indonesian	n/a
2	Menggali Potensi Desa untuk Pengembangan Ko-Investasi Jasa Lingkungan (vol. 8 no. 1)	2015	Indonesian	Available
3	Ketika Hutan Tidak Lagi Menjadi Sumber Mata Pencaharian Utama Bagi Masyarakat di Sekitarnya (vol. 8 no 1)	2016	Indonesian	Available
4	Photo Voice: Mengungkapkan Asa dan Rasa Melalui Foto	2016	Indonesian	n/a

No	Topic/Title	Year	Language	URL
5	Lokakarya pembukaan penelitian Smart Tree-Invest: upaya investasi bersama dalam penyediaan jasa lingkungan di bentang alam Sulawesi	2016	Indonesian	Available
6	Petani AgFor Sulawesi Selatan: Menularkan Kesuksesan di Campaga ke Buol, Sulawesi Tengah	2016	Indonesian	Available
Video				
1	A voice from community	2016	English, Vietnamese	Available
2	Video Baseline Summary of farmers	2015	English, Tagalog	Available
3	Video Baseline Summary of local policy-makers	2016	English, Bisaya, Tagalog	Available
4	Video Baseline Summary of provincial policymakers	2016	English, Bisaya, Tagalog	Available
5	Video: Bumi Pogogul at a glance	2015	Indonesian, English	Available
6	Introduction to Smart Tree-Invest	2016	English	Available
7	Ha Tinh TV news on the STI project sites (10 minutes)	2016	Vietnamese, English	Available
8	Smart-tree Invest (STI) commune workshop 2017 on district TV channel	2016	Vietnamese, English	Available
9	Bermitra bersama alam melestarikan bumi Pogogul	2016	Indonesia/English	Available
10	The 2nd BLVS in Ho Ho sub-watershed, north central Viet Nam	2017	English, Vietnamese	Available
11	The STI Viet Nam project impact video	2017	English, Vietnamese	Available
12	Impact of Smart Tree-Invest Tree-farming learning group	2017	Indonesian, English	Available
13	Building the enabling environment for co-investment in ecosystem services in Indonesia	2017	Indonesian, English	Available
14	Video regional	in progress	English	
Flyer, Poster & Roll Banner				
1	Smart-Tree Invest Project overview (year 1)	2015	English	Available
2	Smart-Tree Invest in Viet Nam	2015	Vietnamese	Available
3	Smart-Tree Invest in Viet Nam	2015	English	Available
4	Smart-Tree Invest in Indonesia	2015	Indonesian	Available
5	Smart-Tree Invest Asia project overview	2015	English	Available
6	Photovoice in Viet Nam: Huong Lam and Huong Hoa	2015	English	Available
7	Photovoice in the Philippines: Tugasan, Alanib and Kulasihan Sub-Watersheds	2015	English	Available
8	A Glance of Buol: Stories from the Local Community about their Environment	2015	English	Available

No	Topic/Title	Year	Language	URL
9	Poster of Smart-Tree Invest in Viet Nam	2015	English	Available
10	Brochure of Smart-Tree Invest Project	2015	English	Available
11	STI Photovoice in Viet Nam	2015	English	Available
12	STI Photovoice in the Philippines: Tugasan, Kulasihan and Alanib sub-watersheds	2015	English	Available
13	A Glance of Buol: Stories from the local community about their environment	2015	English	Available
14	Photovoice of the watershed cluster of STI sites in Buol, Indonesia	2015	Indonesian	Available
15	Photovoice of the coastal cluster of STI sites in Buol, Indonesia	2015	Indonesian	Available
16	Simple monitoring tools for watershed assessment at Buol Watershed, Central Sulawesi	2016	English	Available
17	Hasil penelitian hidrologi: pemantauan sederhana terhadap fungsi DAS Buol bersama masyarakat	2016	Indonesian	Available
18	Kelompok Belajar Berkebun dan Pembibitan	2016	Indonesian	Available
19	Daerah Aliran Sungai dan Siklus hidrologi	2016	Indonesian	Available
20	Back to tree planting	2016	English, Vietnamese	Available
21	Poster on how to recognize and prevent diseases on citrus trees	2016	Vietnamese	Available
22	Photo exhibit on Smart Tree-Invest project in the Philippines	2016	English	n/a
23	STI - Livelihood and environmental benefits	2017	Vietnamese	Available
24	It's Time to Invest in the Manupali Watershed! Capitalizing on sustainable watershed management is good for the environment and your business.	2017	English	n/a
25	Dana Desa dan Ko-investasi Jasa Lingkungan (Village Fund and the co-investment in Ecosystem services)	2017	Indonesian	n/a
26	A Glance of Buol: inducing change for sustainable ecosystem services provisioning	2017	English	Available
Blog articles				
1	A picture paints a thousand words for Smart Tree-Invest project	30/06/2017	English	Available
2	Smart use of trees: Co-investment scheme improves livelihoods, maintains ecosystem services	30/06/2017	English	Available
3	Sharing innovations in climate-smart agriculture	30/06/2017	English	Available
4	Indonesian district government funds replication of ICRAF approaches	17/02/2017	English	Available

No	Topic/Title	Year	Language	URL
5	STI project impacts in Indonesia	9/07/2017		Available
6	Government requests IFAD to continue its support	2016	English	Available
7	Readying the local government for co-investment in ecosystem services	2016	English	Available
8	Business-case training workshop jump-starts co-investment in Philippine watershed	25/04/2016	English	Available
9	Growing Hope with Trees: Farmers Learning Group in Buol, Indonesia	18/02/2016	English	Available
10	Increasing farmers' resilience in Central Viet Nam through agroforestry	29/02/2016	English	Available
11	Farmers and funders need to open their eyes to the benefits of integrated landscapes	6/11/2015	English	Available
12	More sustainable and climate-smart farms with agroforestry	28/10/2015	English	Available
13	Why are Vietnamese farmers not planting trees amid annual crops?	29/10/2015	English	Available
14	Smart-Tree Invest revitalizes ecosystem-services group in Bukidnon	15/09/2015	English	Available
15	Giving voice to the farmers with Photovoice	29/06/2015	English	Available
16	Getting a picture of when nature isn't a friend to farmers	23/06/2015	English	Available
17	Can poor villages improve their livelihoods and protect their environment?	8/05/2015	English	Available
18	Video baseline survey and photographic data collection in Indonesia	10/02/2015	English	Available
19	IFAD investment projects show interest in CaSAVA method	3/11/2014	English	Available
20	Seeing and hearing farmers through photos and videos	23/09/2014	English	Available
21	Smart Tree-Invest inception workshop in the Philippines	14/08/2014	English	Available
22	Smart Tree-Invest inception workshop in Indonesia	12/07/2014	English	Available
23	Trees are smart investments in Viet Nam	16/06/2014	English	Available
24	Smart tree co-investment project holds inception workshop in the Philippines	16/06/2014	English	Available

2. Notable events and activities

No.	Event	Scale	Location	Date
1	Smart Tree-Invest regional kick-off meeting	Southeast Asia	Cebu, the Philippines	April 2014
2	IndoGreen Forestry Expo, national exhibition, organised by the Ministry of Forestry	National	Jakarta Convention Center, Jakarta, Indonesia	11–14 April 2014
3	Forest Asia Summit, organized by CIFOR	National	Shangri-La Hotel, Jakarta, Indonesia	March 2015
4	18th Indonesia Environment Week	National	Jakarta Convention Centre, Jakarta, Indonesia	29 May–1 June 2014
5	Project inception meeting in Buol, Lantapan, and Ha Tinh and Quang Binh	District/Municipality, Province	Each project site	June 2014
6	Courtesy meeting of regional Smart Tree-Invest team with READ Secretariat	National	Ministry of Agriculture, Indonesia	December 2013, February 2014
7	Meeting with MARS Company and Faculty of Agriculture, University of Tadulako, Central Sulawesi	Province	Palu, Central Sulawesi	June 2014
8	READ in Buol District, Central Sulawesi, made cooperation with Smart Tree-Invest as part of its exit strategy	District	READ Buol District Exit Strategy	December 2014
9	Courtesy meeting of Viet Nam Smart Tree-Invest team with Ho Ho Hydropower Company, a potential ecosystem services' buyer	National	Ho Ho Hydropower Company Office, Hanoi, Viet Nam	February 2015
10	Viet Nam National Climate Change Working Group Quarterly Meeting	National	Hanoi, Viet Nam	September 2014, January 2015
11	Regional Smart Tree-Invest team visit to Viet Nam cluster sites	Province	Ha Tinh and Quang Binh Provinces	11–14 March 2015
12	Courtesy meeting of regional Smart Tree-Invest team with SRDPP project	Province	IFAD project office in Ha Tinh Province, Viet Nam	14 March 2015
13	2nd IFAD Philippines quarterly meeting involving national government officers	National	Manila, Philippines	September 2014
14	Courtesy meeting of Philippine Smart Tree-Invest team with IFAD loan project	National	Department of Agriculture, Quezon City, Philippines	26–27 May 2014
15	Inception meeting of Philippine Smart Tree-Invest Team in Lantapan, Bukidnon	Municipal	Malaybalay City, Bukidnon, Philippines	1 August 2014
16	IFAD Knowledge and Learning Market-Policy Engagement Event	National	Quezon City, Manila	25–26 November 2015

No.	Event	Scale	Location	Date
17	National workshops (in collaboration with Indonesia Institute of Sciences): Co-investment of ES to Promote Sustainable Village Development	National	Jakarta, Indonesia	5 May 2016
18	District consultation meeting: Preliminary 1st year Research Results	District	Buol, Indonesia	February 2015
19	District Meetings, series of awareness raising and facilitation for the establishment of Watershed Working Group	District	Buol, Indonesia	March–June 2016
20	Meeting with the provincial and national authorities to raise awareness and see the potential collaboration with Smart Tree-Invest	National and Province	Jakarta and Palu, Indonesia	June 2015, October 2015, March 2016
21	IFAD Asia Pacific Workshop	Regional, Asia Pacific	Bali, Indonesia	27–29 October 2015
22	PES Working Group Outcome Mapping Workshop	National	Claveria, Philippines	15–16 July 2015
23	Strategic planning series of meeting with PES Working group and Village leaders from the cluster sites	Municipal	Lantapan, Philippines	August 2015
24	National Workshop: Review of PFES Implementation in Viet Nam	National	Ha Noi, Viet Nam	December 2015
25	Workshop in collaboration with Regional Sustainable Social Research Institute (RSSRI): Development of Regional Masterplan for Ha Tinh Province	National	Ha Noi, Viet Nam	July 2015
26	Workshops: Huong Khe Watershed stakeholders' sharing workshop on findings in year 1 and consultation on Hydrological research results	Watershed	Ha Tinh and Quang Binh Provinces, Viet Nam	June 2015
27	Series of Meeting with IFAD representatives in Ha Tinh and Quang Binh Provinces	Provincial	Ha Tinh and Quang Binh Provinces, Viet Nam	April and November 2015
28	Meeting with the potential co-investor of ecosystem services from the private sectors (Local Tree Nursery Company, Hydropower plant)	Watershed	Ha Tinh Province, Viet Nam	October 2015 and February 2016
29	ADB Food Security Forum and Exhibition	Southeast Asia	Manila, the Philippines	22–24 June 2016
30	IFAD Grant Supervision Mission	Southeast Asia	Manila, the Philippines	25–28 June 2016
31	Co-investment and ecosystem services: a session in the Asian ESP Conference	Asia	Ansan City, South Korea	May 2016

No.	Event	Scale	Location	Date
32	CSA Training for IFAD's SRDP staff and Farmers' Union staff	Provincial	Ha Tinh City, Viet Nam	October–November 2016
33	Training of trainers: Ecosystem services concept and practices, and Monitoring of ecosystem services	District	Buol District, Indonesia	October–November 2016
34	Breakfast meeting with IFAD Indonesia Office	National	Jakarta, Indonesia	10 October 2016
35	Project coordination meeting with the Philippines team during ICRAF Science Week 2016	National	Nairobi, Kenya	September 2016
36	Reporting and strategic planning meeting with Lantapan Municipal Council and PES Working Group	Municipal	Lantapan, Philippines	5 September 2016
36	Quarterly meeting of IFAD and Viet Nam Farmers' Union	National	Hanoi	June, September and December 2016
37	Viet Nam PES Network Meeting	National	Ha Noi	February 2017
38	Provincial reporting workshop	Provincial	Palu, Central Sulawesi, Indonesia	28 February 2017
39	Tree-farming learning group closing ceremonies at the village level	Village	Eight village cluster sites in Buol, Indonesia	February 2017
40	Communal Closing Workshop in Viet Nam	Commune/Cluster	Huong Lam and Huong Hoa Commune in Ha Tinh and Quang Binh Provinces	24 March 2017
41	Provincial Closing Workshop in Viet Nam	Provincial	Ha Tinh City, Ha Tinh Province, Viet Nam	12 April 2017
43	Mindanao River Basin Management Council Meeting	Mindanao	MinDA Office, Davao City, the Philippines`	3 March 2017
42	Water users and policy forum	National	Manila, the Philippines	April 2017
43	Smart Tree-Invest regional closing workshop	Southeast Asia	Jakarta, Indonesia	17 May 2017

3. Disbursement by Component and by category of expenditure (On progress)

4. Workshop proceeding–Smart Tree-Invest Regional Closing Workshop

5. Hydrological function and target of intervention and applicability of 10 PWS prototypes in the various landscape configurations, as represented in the case studies

Primary watershed issue	Indicative ranking on degree of reversibility by human intervention at each landscape configuration [a]					PWS prototypes: plausible actions by land users to enhance hydrological function	Business model: (insurance premium) for or on behalf of beneficiaries	Potential basis for joint monitoring of conditional contracts
	I	II [b]	III	IV	V			
Water yield (Annual blue-water yield versus green-water use.)	*	+	+	++	+++	WY1: Restoring vegetation-level water use, and hence subsurface and surface flows, to that of natural vegetation from values that are lower (less or more-open vegetation) or higher (fast-growing trees) [c]; WY2: Maintaining ecological flows that support aquatic life forms (and associated fisheries etc.)	• Avoidance of changes in overall hydrology with associated risks • In specific landscapes: avoidance of recirculation of subsurface salinity • Continued aquatic systems with associated services	o Total vegetation cover and/or specified tree frequency by size, location and type, linked to water balance models of usable blue water in relation to rainfall o River flow in specified locations, with disclaimers (force majeure) for extreme weather episodes o Native aquatic species diversity
Rainfall pattern elsewhere (rainbow water)	++	+	+	+	-	WY3: Maintaining green water use as contribution to atmospheric recycling for downwind rainfall	Increase of down-wind rainfall and buffered rainfall variability relative to ocean-temperature patterns	o Vegetation type, linked to location-specific coupled vegetation-rainfall-climate models
Flow pattern of blue water	*	++	+++	++	+	WF4: Increasing rainfall infiltration, maximizing use of slow-release groundwater pathways, reducing flood volume and duration (increased flow persistence) WF5: Modifying operating rules for reservoirs and hydropower schemes [c]	• To reduce flood disaster risks • To enhance dry season flows, extending time period for usable blue water • Regular water supply for run-of-the-river hydropower generators (including micro-hydro plants)	o River flow persistence (predictability in time series) o Presence of vegetative cover and/or surface litter as influence on infiltration

Controlling sediment load of rivers	*	+++	+++	++	++	WS6: Enhancing sediment filter strips in fields and across landscape matrix WS7: Protecting river banks, riparian zones and landslide-prone slopes	• To improve efficiency of reservoir-based and run-of-the-river hydropower operators and drinking water provisioning filters • Avoid mudflows and dam bursts • Avoid marine sedimentation on coral reefs	o Sediment load of streams and rivers at specified observation points o Vegetative and litter layer sediment filter zones o Vegetation in riparian zones
Water quality	*	++	++	+++	++	WQ8: Protecting springs and sources of domestic water use WQ9: Reducing point and distributed (nonpoint) sources of pollution WQ10: Waste-water treatment to match biological recovery from (organic) pollutants	• Water quality for domestic and industrial use • Reduced costs of water treatment • Aquatic ecosystem services and effects on coastal marine systems	o Biological water quality indicators (biota-based) o Biological oxygen demand o *Escherichia coli* counts o Agreed measures to control point sources and reduce nonpoint sources (e.g. agrochemicals)

Note: WY = water yield, WF = water flow, WS = water sedimentation; WQ = water quality

a. * means prime watershed conditions conducive to watershed service provision; + indicates degree of reversibility in ecosystem service provision by certain human interventions in specific configurations: + = weak; ++ = medium; +++ = strong. See Annex 1 for the landscape
b. This configuration was not represented in the four Indonesian cases, but an example from Northern Thailand was discussed by van Noordwijk et al. (2014a).
c. Green-water use is directly related to local benefits through micro-climate effects on air humidity and temperature.
d. Flooding, as occurred in Bangkok in 2011–2012 in the Chao Phraya basin, can be due to end-of-season rains at a time all reservoirs are full, to maximize dry-season water availability.

Source: Leimona, B., Lusiana, B., van Noordwijk, M., Mulyoutami, E., Ekadinata, A., Amaruzaman, S., 2015. Boundary work: Knowledge co-production for negotiating payment for watershed services in Indonesia. Ecosystem Services 15, 45–62.

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The Smart Tree-Invest project consisted of three main phases: scoping (research), intervention and mainstreaming. The project started with the effort to understand landscape characteristics, particularly with regards to vulnerabilities and actions to improve smallholder resilience. The project then initiated pilot co-investment activities with smallholders and local development actors. In the final phase, the lessons learnt and best practices were integrated with government policy and programs at local and national levels.

The project took a landscape approach that identifies project sites as clusters or typologies with similar ecological and socio-economical traits. Each country site's unique characteristics (i.e. the problems, threats, strengths, and opportunities) defined the design of its co-investment schemes. The typology resulted from the landscape approach will provide models representing the contexts, proposed actions and solutions that may contribute as inputs for further replications and scale-ups to other areas matched with the typologies within certain jurisdiction boundary (i.e. national, province, district).