

**EVALUATION OF THE IMPACTS
OF THE THAILAND GOVERNMENT'S
400-BILLION-BAHT ECONOMIC AND SOCIAL
REHABILITATION FUND PACKAGE
ON SUSTAINABLE DEVELOPMENT GOALS (SDGS),
NATIONALLY DETERMINED CONTRIBUTIONS (NDCS),
AND OTHER GLOBAL SUSTAINABILITY FRAMEWORKS**



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Executive Summary

Thailand joined the Partnership for Action on Green Economy (PAGE) initiative in 2019 to facilitate its economic transition toward an inclusive green economy (IGE). During the PAGE inception phase in 2020, the challenges of COVID-19 began to emerge as a new reality across the nation. The Government of Thailand acted swiftly to rescue the economy with a solid commitment to “build back better.” PAGE operates under the UN Global Framework for the Immediate Socio-Economic Response to COVID-19 as a vehicle for the UN’s support of government-led efforts for a job-rich green economic recovery that leaves no one behind. This study evaluates the impacts of the Thai Government’s 400-billion-Baht Economic and Social Rehabilitation Fund Package on Sustainable Development Goals (SDGs), Nationally Determined Contributions (NDCs), and other global sustainability frameworks. The study aims to conduct an in-depth assessment of the six selected projects funded under the 400-billion Baht Rehabilitation Fund of the Royal Thai Government from a green perspective to advance the green economy agenda in national economic recovery policy formulation. Based on the findings of this analysis, policy guidance was developed to assist the government in creating SDG- and NDC-aligned policies and recovery packages.

The six selected projects are as follows:

i. One Tambon One New Theory Agriculture Group (OT-ONTAG): This project aims to strengthen the development of the local community’s economy and food security by providing capacity building to farmers to adopt new theory agriculture and sufficiency economy principles. It also promotes the marketing of agricultural products in each Tambon (subdistrict) throughout the country.

ii. Kok Nong Na (Land-Water-Rice Field) Model (KNN): This model intends to foster the adoption of the Sufficiency Economy Philosophy (SEP) in farming practices and living to meet the SDGs and develop the Community and Household Lab Model for Quality of Life.

iii. Development of Pilot Areas for Travel Safety Zones: This project focuses on developing pilot areas for safe travel, knowledge on safe travel, and conducting public relations activities concerning these pilot areas for foreign and domestic tourists.

iv. Upgrading the Economy in the Central-Western Economic Corridor using the BCG (Bio-Circular-Green) model: This project emphasizes improving agricultural production by applying technologies and innovation to increase the competitiveness of related industrial processes and reduce costs and environmental impact. Following the BCG model, it also aims to add value to agricultural products throughout the value chain.

v. Cotton Valley Creation: This project promotes the community-level cotton industry in Loei province and creates an alternative income stream for local communities.

vi. Processing of Dried Banana using Solar Energy in Pang-Nga Province: This project creates career opportunities for community members by upgrading community production in the market to a higher quality.

A set of evaluation criteria was developed and used to evaluate the projects on three levels: first, evaluation in the project cycle stage, including project design, planning, and implementation; second, the output/outcome achievement and impacts on SDGs and NDCs; and third, project value-for-money using a descriptive cost-benefit analysis or financial analysis to demonstrate if the benefits of making the projects greener would outweigh the cost.

The methodology for collecting data regarding the evaluation process included reviewing project documents and related records and collecting primary data through questionnaire surveys, in-depth interviews, and focus groups. These methods were utilized to acquire information from project stakeholders, such as officials from responsible government agencies, the project manager and team members, direct project beneficiaries, and individuals affected by the project.

In this study, data analysis employed both qualitative and quantitative approaches. Each project evaluator rated each evaluation criterion mentioned above on a 1-5 level Likert scale, accompanied by supporting evidence, reasons, and explanations. Two analysis frameworks were utilized to assess the selected projects: multi-criteria decision analysis (MCDA) and descriptive cost-benefit analysis (CBA).

To analyze the data, the set of evaluations was grouped into five dimensions addressing the project cycle process, outputs/outcomes, and impacts as follows: 1) relevance/coherence, 2) efficiency, 3) effectiveness, 4) impacts, and 5) sustainability. Each dimension was considered to have equal weight, except for the impact criteria, which was assigned slightly greater weight due to the primary objectives of the economic rehabilitation package focusing more on economic recovery after COVID-19.

The determined evaluation criteria revealed that most selected projects under the 400-billion Baht Rehabilitation package demonstrated moderate performance, except the Travel Safety Zone project, which performed slightly less well. The results highlighted that the Impact on SDGs and NDCs and Sustainability (the continuity of projects' benefits and impacts) aspects scored relatively lower than the other aspects of the Project Cycle Process (Project Design, Planning, and Implementation). This could be attributed to the project's primary focus on economic recovery following the COVID-19 outbreak, with their objectives being partially linked to global goals such as the SDGs and NDCs but not constituting their main focus.

The project cycle process was evaluated closely, starting from the design, planning, and implementation, and the selected projects performed fairly well. Even though the project's objectives were laid out top-down by the responsible government agencies, some needs were gathered from local or rural officers, with no direct or only slight involvement from the target groups. Nonetheless, the criteria and qualifications of the target groups were appropriate in response to the project objectives. Project planning and analysis were clearly

defined and coherent with the project outputs and outcomes. The project's activities covered all deliverables, with a clearly defined technical analysis related to those activities. In addition, the project's organization and structure were defined, related to the project activities, and functioned as internal risk management mechanisms. From these aspects, all selected projects have shown a moderate to high achievement rate in the project-determined outputs and outcomes. However, one observation in the planning process is that some of the selected projects yielded no evidence of a value-for-money analysis before implementation due to the rush in approval and budget disbursement aimed at economic recovery.

Even though there are limitations on SDGs and NDCs impact estimates in the project design and planning process, the selected projects' objectives, to some extent, could impact the SDGs and NDCs in all environmental, economic, and social aspects. Some selected projects, such as OT-ONTAG and KNN, both agricultural-based projects, have impacts covering all sustainability domains. However, the rest do not address the environmental and social domains, especially the Travel Safety Zone project. Moreover, project sustainability, or continuing the projects' benefits and impacts, is crucial as most projects require a long time for the benefits to come to fruition. Thus, policy continuity and some legal and budgetary obligations for continued support from government agencies should be seriously considered.

Moreover, each selected project was evaluated for its value for money through financial or descriptive cost-benefit analysis. This evaluation found that almost every project demonstrated that the benefits of making the projects greener and more inclusive would outweigh the costs based on the SDGs framework, except for the BCG model project, which has not yet been completed to deliver the expected outcomes. Some projects may have more apparent and significant benefits on the environmental and social sides than economic sides; however, some have clear benefits in every aspect of sustainable development. Despite this, the project sustainability in terms of continuing the project's benefits and expanding the project remains an issue.

Based on each project's evaluation report, the policy guidance and recommendations were presented and divided into two parts: Firstly, the general recommendation on the project cycle process, outputs, outcomes, and impacts on SDGs, NDCs, and its sustainability. Secondly, the overall policy guidance and recommendations to assist the government and policymakers in developing future SDGs and NDC-aligned policies as well as recovery packages are addressed through the following main issues: 1) project cycle process improvement, 2) capacity building, 3) research and innovation towards SDGs, NDCs, and BCG model, 4) transformative partnership, and 5) financial sustainability.

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Abbreviations and acronyms

ASEAN	Association of Southeast Asian Nations
BCG	Bio-Circular-Green
CBA	Cost-Benefit Analysis
IGE	Inclusive Green Economy
ILO	International Labor Organization
KNN	Kok Nong Na Model
MCDA	Multi-Criteria Decision Analysis
NDCs	Nationally Determined Contributions
NESDC	The Office of the National Economic and Social Development Council
NFE	The Office of Non-Formal and Informal Education
NIDA	National Institute of Development Administration
NTA	New Theory Agriculture
OT-ONTAG	One Tambon One New Theory Agriculture Group
PAGE	Partnership for Action on Green Economy
SDGs	Sustainable Development Goals
SCP-HAT	Sustainable Consumption and Production Hotspots Analysis Tool
SEP	The Sufficiency Economy Philosophy
TISTR	Thailand Institute of Scientific and Technological Research
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
UNRCO	United Nations Resident Coordinator Office
UNITAR	United Nations Institute for Training and Research

1. INTRODUCTION

During 2020-2021, Thailand experienced a severe situation due to the COVID-19 pandemic. There was a need for fiscal stimulus, including cash transfers, to recover from the pandemic. Thailand has devoted much effort to recovery measures, focusing on the economic rehabilitation package. Despite these economic challenges, Thailand has committed to transition towards a Bio-Circular-Green Economy (BCG), is taking action to foster sustainable finance, and has verbally committed to adhering to its NDCs, SDG, and post-2020 biodiversity targets. Green fiscal policy measures should provide innovative options for Thailand to create more fiscal space and jumpstart economic recovery while also building a path toward a circular, clean, and green economic system. However, calculated and coordinated fiscal planning involving inputs and buy-in from various government stakeholders is necessary for such policies to be designed and implemented successfully (UNEP, 2022 details shown in ANNEX_V).

Additionally, the SCP-HAT Country Report Thailand (UNEP, 2023) provided some policy recommendations for Thailand to address environmental pressures and impacts, mainly focusing on sectors with significant contributions based on the data and analysis by the Sustainable Consumption and Production Hotspots Analysis Tool. These policy recommendations aim to balance economic growth with environmental sustainability and address the specific challenges presented by different sectors in Thailand. Implementing a combination of these policies can help reduce the country's environmental footprint while supporting its economic development goals. Details on the analysis and recommendations are attached in Annex VI.

The Royal Thai Government financed a 400-billion-baht economic rehabilitation program as a part of its 1.9 trillion Baht COVID-19 response package. The 400-billion-baht program aims to strengthen the foundation economy, focus on prosperity in the sub-national economy, and stimulate domestic demand to drive the country's service economy and overall economy. This program will address agricultural and agriculture-related industries, value-added, bio-circular-green (BCG) models, and high-quality tourism. The program is set to be implemented in 2020 and 2021.

This rehabilitation program will be centered around four underlying themes:

1) *Future Sustainable Growth*, which is centered around commercial agriculture to increase efficiency. Examples of projects include smart agriculture, precision farming, and intensive mega farming. Value-added, food safety, and biodiversity are also emphasized. These themes of future sustainable growth will also include tourism, focusing on raising the quality of tourism and developing a creative economy;

2) *Local and Community Growth*, which is centered around family farm production and marketing, community production, community-level job creation, water resources, digital platforms, logistics to support community products, and community tourism;

3) *Promoting economic stability, improving local infrastructure, and increasing production and service capacity*; and

4) *Promoting and stimulating private and household consumption*, including the national Baht 22.4 billion tourism subsidy.

Managed by the Office of the National Economic and Social Development Council (NESDC), the Fund offers financial support for projects submitted by national, local, and provincial authorities that are consistent with the policy framework of economic and social recovery from the COVID-19 outbreak and directly sustain employment, reduce costs, and create business opportunities in response to new normal or changes in the economic structure. The economic rehabilitation program aims to create over 400,000 jobs, with a more holistic objective of stimulating and transforming the rural economy and supporting the unemployed (due to COVID-19) in urban areas. Public entities propose all projects funded by this stimulus program. As of September 2021, 236 project¹ were approved and implemented starting in October 2020.

Thailand joined The Partnership for Action on Green Economy (PAGE) initiative in 2019 to facilitate its economic transition toward an Inclusive Green Economy (IGE). During the PAGE inception phase in 2020, the challenges of COVID-19 emerged as a new reality across the nation. The government of Thailand has acted swiftly to rescue the economy and has made a solid commitment to "build back better." PAGE is included in the UN global framework for the Immediate Socio-Economic Response to COVID-19 as a vehicle of UN support to government-led efforts for a job-rich green economic recovery that leaves no one behind, especially women and girls. PAGE, a collaboration of five UN Agencies (UNEP, UNDP, UNIDO, UNITAR, and ILO), in collaboration with the United Nations Resident Coordinator Office (UNRCO) in Thailand, supported Thailand in aligning economic recovery packages with SDGs and ambitions of the global climate and nature frameworks through the "Country Needs Assessment for a Green Economic Recovery." The assessment aims at (1) illuminating the extent to which Thailand's COVID-19 recovery effort is contributing to the country's transition towards a decarbonized and resource-efficient economy; (2) informing how green and climate-friendly COVID-19 Recovery projects are; (3) creating public discourse on green recovery to encourage and advocate for a new normal that is climate-friendly, low emissions and environmentally responsible, and (4) showcasing Thailand's experience as a leading model for a recovery program that is green and climate-friendly at the regional and global levels.

2. OBJECTIVES OF THE STUDY

The study's objective was to conduct an in-depth assessment of the six selected projects funded under the 400-billion Baht Rehabilitation Fund of the Royal Thai Government from a green perspective to advance the green economy agenda in national economic recovery policy formulation. Based on the findings of this analysis, policy guidance will be developed to assist the government in developing SDG- and NDC-aligned policies and recovery packages.

¹ NESDC. <http://thaime.nesdc.go.th/>

3. THE STUDY'S CONCEPTUAL FRAMEWORK

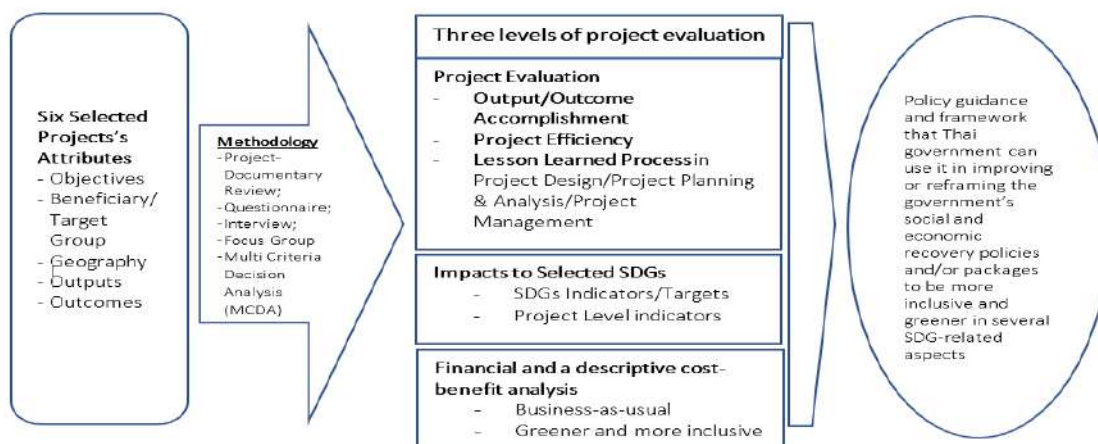


Figure 1: Research Conceptual Framework

A set of evaluation criteria was developed and used to evaluate the projects on three levels, as shown in Figure 1. First, the evaluation in the project cycle stage from project design, analysis, and implementation; second, the output/outcome achievement and impacts on SDGs, NDCs, and other global sustainability frameworks; and third, the cost-benefit analysis to demonstrate whether the benefits of making the projects greener would outweigh the cost.

3.1 Project Cycle Evaluation

To achieve the study's objective, each project's attributes were reviewed through the project-related documents and assessed for output/outcome accomplishment and efficiency. Moreover, the lessons-learned process addressed the three main questions regarding the project design, project planning & analysis, and project implementation/management: What went right? What went wrong? And what needs to be improved?

This evaluation stage aims for the lessons-learned process to define the activities required to ascertain and use the lessons learned successfully. The lessons-learned process comprises five steps: identify, document, analyze, store, and retrieve. These steps are consistent for all project management processes; however, the tools and techniques become more involved in each step. Regardless of the process, viewing the lessons learned as constructive is essential. Using project evaluation procedures, leadership should encourage stakeholders to engage in the process, utilize the tools, and leverage the results to monitor achievement.

3.2 The Impact of Projects on SDGs

The following evaluation criteria assess the projects' impacts on key selected SDGs, NDCs, and/or other global sustainability frameworks, using Multi-Criteria Decision Analysis (MCDA) to analyze the collected data and provide technical advice based on the results of each project evaluation. The aim is to make the evaluated projects greener and more inclusive and to develop policy recommendations based on the results of each project evaluation.

3.3 Cost-Benefit Analysis

Using data from the data collection process, a descriptive cost-benefit analysis was conducted by comparing (i) the business-as-usual scenario (continue to implement the projects as they are) and (ii) making the projects greener and more inclusive. The cost-benefit analysis aims to demonstrate that the benefits of greening the projects outweigh the costs. Therefore, it motivates policymakers to adopt green recovery measures or policy initiatives.

4. SCOPE OF THE STUDY

4.1 Selected Projects

The six selected projects varied in geographical location and size (used budget). Their expected goals and outcomes are as follows:

Projects	Geographical location	Used Budget	Goals/Outcomes
1) One Tambon One New Theory Agricultural Group Project	Countrywide implemented Study Sites: Phra Nakhon Si Ayutthaya, Loei, Phang Nga, and Nan	2,610.8 mil. baht	<ul style="list-style-type: none"> • Sustainable agriculture • Sustainable water management • Creation of jobs
2) Development of Pilot Areas for Improving Quality of Life Based on New Theory Applied to the Kok Nong Na Model	Countrywide implemented Study Sites: Phra Nakhon Si Ayutthaya, Loei, Phang Nga, and Nan	4,787.91 mil. baht	<ul style="list-style-type: none"> • Creation of jobs • Increase forest areas for fresh air and retain carbon, reduce PM 2.5 • Sustainable communities • Renewable energy promotion • Sustainable agriculture • Food security for households and communities
3) Development of Pilot Areas for the Travel Safety Zone	Five Pilot Travel Safety Zones Study Sites: Chonburi and Nan	15 mil. baht	<ul style="list-style-type: none"> • Quality tourism • Income creation • Creation of employment
4) Upgrading the Economy in the Central-Western Economic Corridor using the BCG model	Five Provinces Study Sites: Suphanburi, and Kanchanaburi	115.36 mil. baht	<ul style="list-style-type: none"> • Development of bio-packaging, raw material, or industrial waste with an environmentally friendly manufacturing process to increase value. • Manufacturing value-added products
5) Cotton Valley Creation	Loei Province	16.5 mil. baht	<ul style="list-style-type: none"> • Creation of jobs • Domestic and international tourism • Non-toxic cotton products
6) Processing of Solar-dried Bananas to Generate Income for the Community	Phang-Nga Province	0.4 mil. baht	<ul style="list-style-type: none"> • Income creation • Renewable energy promotion • Sustainable communities • Food security for households and communities

Remarks: Each project's background and attributes showing the project's objectives, demographic target groups, geography, outputs, outcomes, and status are shown in Annex II.

4.2 Project Areas and Sites

The research team visited the project sites in the following provinces in the data collection process.

Province	Region	Projects
Loei	North-East	<ul style="list-style-type: none"> - Project#1: One Tambon One New Theory Agriculture Group - Project#2: Kok Nong Na Model - Project#5: Cotton Valley Creation
Phra Nakhon Si Ayutthaya	Central	<ul style="list-style-type: none"> - Project#1: One Tambon One New Theory Agriculture Group - Project #2: Kok Nong Na Model
Nan	North	<ul style="list-style-type: none"> - Project #1: One Tambon One New Theory Agriculture Group - Project #2: Kok Nong Na Model - Project#3: Development of Pilot Areas for Travel Safety Zones (Nan Old Town in Nan – a Model of an Urban Tourism Area)
Bangkok	Central	<ul style="list-style-type: none"> - Project#3: Development of Pilot Areas for Travel Safety Zones (Asiatique the Riverfront – a Model of a Man-made Pilot Area)
Chonburi	Central	<ul style="list-style-type: none"> - Project#3: Development of Pilot Areas for Travel Safety Zones (Bang Saen Beach – a Natural Tourism Area)
Pathum Thani	Central	<ul style="list-style-type: none"> - Project#4: Upgrading the Economy in the Central-Western Economic Corridor using the BCG model
Suphan Buri	Central	<ul style="list-style-type: none"> - Project#4: Upgrading the Economy in the Central-Western Economic Corridor using the BCG model
Kanchanaburi	Central	<ul style="list-style-type: none"> - Project#4: Upgrading the Economy in the Central-Western Economic Corridor using the BCG model
Phang-nga	South	<ul style="list-style-type: none"> - Project#1: One Tambon One New Theory Agriculture Group - Project #2: Kok Nong Na Model - Project#6 Processing of Solar-power Dried Bananas to Generate Income for the Community

Remark: The detailed site visits for each project are addressed in each evaluation report shown in Annex II.

5. RESEARCH METHODOLOGY

5.1 Development of Evaluation Criteria

The evaluation criteria were developed using the conceptual framework presented in Figure 2. They were divided into two main categories: General Indicators and Specific Indicators. The details are as follows:

General Indicators were used to evaluate each selected project, emphasizing process-based evaluation to understand how the projects were developed and implemented. Thus, the indicators covered the project design, planning, and implementation stages in the project cycle.

Specific Indicators, or project-level indicators, emphasized goal-based, outcome-based, and impact evaluation. These indicators covered the project outputs, outcomes, and impact on SDGs/NDCs and other development goals and were more specific to each project.

Each selected project was evaluated using both sets of indicators developed. The set of general evaluation criteria is presented in Table 1 below, with the set of specific evaluation criteria for each selected project in Tables 2.1-2.6, respectively.

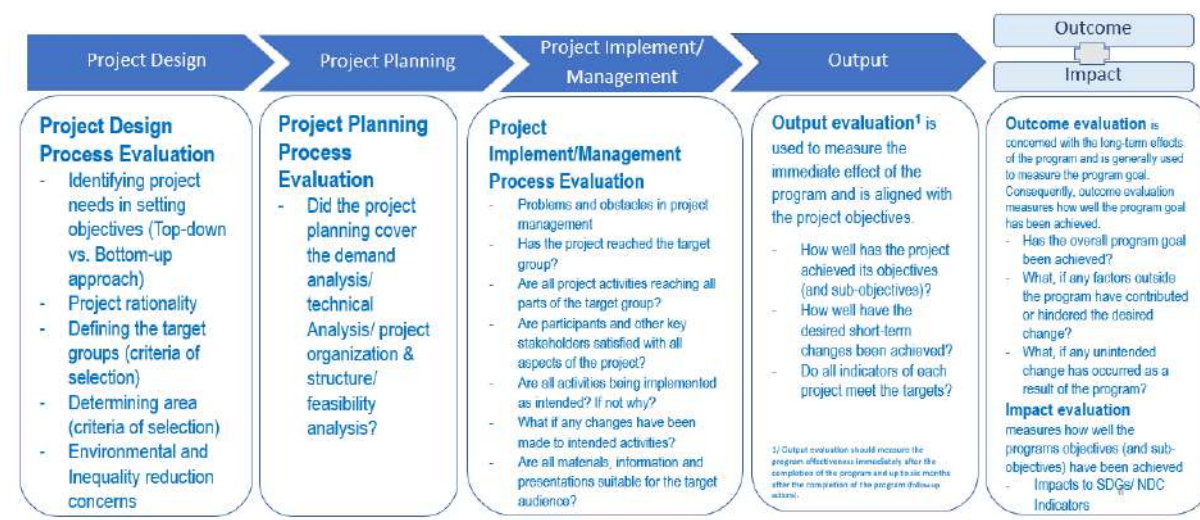


Figure 2: The Evaluation Criteria Development Framework

Table 1: The set of general evaluation criteria for the selected projects.

The set of evaluation criteria emphasized the project design, planning, and implementation process to assess whether the projects had been well developed to achieve their goals and objectives.

Project Cycle Process	Evaluation Questions/Issues	QT/QL*	The scale of measurements (1 to 5 interval scale)
Project Design (5 Indicators)			
1) Identifying project target group needs in setting objectives	<ul style="list-style-type: none"> - How was the project designed with objectives? - Were there any forms of need analysis or supporting information to set the project objectives? <p>* Identifying the evidence showing the target groups and stakeholders' involvement in project design and setting its objectives process If the bottom-up approach is used, the procedure must be identified, showing the bottom-up approach to setting objectives.</p>	QL	<ul style="list-style-type: none"> 1- No evidence identifying procedure to define the project needs before setting the project objectives 2- Objectives mainly set by using a top-down approach and slightly bottom-up to ascertain the needs of the target group 3- Objectives mainly set by using a top-down approach, with some needs gathered from the target group 4- Objectives mainly set by a top-down approach with needs gathered from all target groups and stakeholders 5- Objectives set via working together from top-down and bottom-up approaches
2) Project rationality	<ul style="list-style-type: none"> - What was the project's rationale? - Did the project rationale align with the SDGs and NDCs? 	QL	<ul style="list-style-type: none"> 1- The project's rationale and the SDGs and NDCs not related 2- Slightly related 3- Moderately related 4- Quite related 5- Strongly related

Project Cycle Process	Evaluation Questions/Issues	QT/QL*	The scale of measurements (1 to 5 interval scale)
3) Defining the target groups (criteria of selection)	<ul style="list-style-type: none"> - What were the criteria used to identify the project's target groups? - How well were the criteria developed? - Were the target groups appropriate in response to project objectives? - Did the criteria ensure equity and inclusiveness? 	QL	<ul style="list-style-type: none"> 1- No criteria determined and not able to identify whether the target group was appropriate 2- Some criteria but hardly defined so as to ensure the target groups were appropriate 3- Fairly clear criteria and moderately ensured that the target groups were appropriate 4- Quite clear criteria, and most target groups were appropriate 5- Very clear criteria with all target groups appropriate
4) Output/ Outcome/ Impact to SDGs and NDCs	<ul style="list-style-type: none"> - How did the outputs and outcomes of the project address the impacts on related SDGs and NDCs? - Identifying the SDGs and NDCs related to the project (i.e., Green Recovery, Environmental, Inequality Reduction, and Inclusiveness) 	QL	<ul style="list-style-type: none"> 1- The project's output/outcome and the impacts on SDGs, NDCs, and BCG component not related 2- Slightly related 3- Moderately related 4- Quite related 5- Strongly related

Project Cycle Process	Evaluation Questions/Issues	QT/QL*	The scale of measurements (1 to 5 interval scale)
5) Defining the project risk management process	<ul style="list-style-type: none"> - Were there any concerns about the risks related to the project in the project design process? - Were any expected risks or obstacles that would make the project unsuccessful? - Was there any risk prevention or management integrated into the project design? <p>*If any, identify the risks and obstacles to the project's achievement and the risk management process</p>	QL	<ul style="list-style-type: none"> 1- No risks and obstacles were determined and managed 2- Some risks or obstacles were determined but hardly defined and managed 3- Some risks or obstacles were fairly determined and managed 4- Some risks or obstacles were well-determined and managed 5- All risks and obstacles were well-defined and managed

Project Cycle Process	Evaluation Questions/Issues	QT/QL*	The scale of measurements (1 to 5 interval scale)
Project Planning and Analysis			
6) The project's activity analysis	<ul style="list-style-type: none"> - What were the project activities? - Did the project activity cover the deliverables of the project's expected output/outcome ? - How did SDGs and NDCs develop into activities or criteria to select the counterparts in each activity? 	QL	<ul style="list-style-type: none"> 1- Project activities not clearly defined 2- Project activities slightly clearly defined but did not cover the expected outputs/outcome 3- Somewhat clearly defined and covered the project outputs and outcome 4- Clearly defined and covered the project outputs/outcome and related to the SDGs and NDCs 5- Very clearly defined and covered the project output/outcomes and related to the SDGs and NDCs
7) Involvement of target groups/ stakeholders in project planning and analysis.	<ul style="list-style-type: none"> - Were the project's target group and stakeholders involved in the project planning and analysis? (If any, identify the activities.) 	QL	<ul style="list-style-type: none"> 1- No involvement 2- Slightly involved but did not cover all the target groups and stakeholders 3- Moderately involved but did not cover all the target groups and stakeholders 4- Most of the target groups and stakeholders were involved 5- All of the target groups and stakeholders were involved

Project Cycle Process	Evaluation Questions/Issues	QT/QL*	The scale of measurements (1 to 5 interval scale)
8) The project's technical analysis	<ul style="list-style-type: none"> - What were the project's resource requirements? - Were the project's resources suitably related to the project's activities? - How were the project's resources obtained? 	QL	<ul style="list-style-type: none"> 1- The project's resource requirements are not clearly defined 2- Slightly clearly defined but not related to the project activities 3- Moderately clearly defined and partly related to the project activities 4- Quite clearly defined and mostly related to the project activities 5- Well-defined and all related to the project activities
9) The project's project organization & structure	<ul style="list-style-type: none"> - How was the project's team formed? If any, define the procedure 	QL	<ul style="list-style-type: none"> 1- The project's organization & structure are not clearly defined 2- Slightly clearly defined but not related to the project activities 3- Moderately clearly defined and partly related to the project activities 4- Quite clearly defined and mostly related to the project activities 5- Well-defined and all related to the project activities

Project Cycle Process	Evaluation Questions/Issues	QT/QL*	The scale of measurements (1 to 5 interval scale)
10) The project's value-for-money analysis	<p>- Was any assessment of the project's value-for-money conducted?</p> <p>*Either qualitative or quantitative analysis is acceptable for evaluation.</p>	QL	<p>1- No analysis was conducted</p> <p>2- Some analysis but barely establishing any results</p> <p>3- Fairly well-conducted cost and benefit analysis, with positive results</p> <p>4- Quite well-conducted cost and benefit analysis, with positive results in some dimensions (i.e., economic, social, and environmental)</p> <p>5- Well-conducted cost and benefit study, both economic and financial analysis with positive results in all dimensions (economic, social, and environmental)</p>
Project Implementation			
11) Produce the planned deliverables (percentage of achievement)	<p>- Did the project achieve all the planned deliverables?</p>	QT	<p>1- None or few of the planned deliverables achieved (25% achievement or less)</p> <p>2- Some of the planned deliverables were achieved (more than 25% achievement), but few activity indicators met the target</p> <p>3- Most of the planned deliverables were achieved (more than 50% achievement), and some activity indicators met the target</p> <p>4- Most of the planned deliverables were achieved (more than 75% achievement), and some activity indicators met the target</p> <p>5- All the planned deliverables were achieved, and all activity indicators met the target</p>

Project Cycle Process	Evaluation Questions/Issues	QT/QL*	The scale of measurements (1 to 5 interval scale)
12) Implement the plan	<ul style="list-style-type: none"> - Did the project reach the target group? - Did all project activities reach all parts of the target group? - Were all the project activities implemented as planned? 	QT/ QL	<ul style="list-style-type: none"> 1- Did not meet the planned target group 2- Partly met the planned target group, not achieved the target indicators 3- Mostly met the planned target group and partly achieved the target indicators 4- Mostly met the planned target group and achieved the target indicators 5- Well accomplished and reached all target indicators
13) Measure of interim results attained	<ul style="list-style-type: none"> - Were the participants and other key stakeholders satisfied with all aspects of the project? (Assessed from the beneficiaries' perception) 	QT/ QL	<ul style="list-style-type: none"> 1- No assessment of beneficiaries' satisfaction 2- Project beneficiaries were slightly satisfied 3- Project beneficiaries were moderately satisfied 4- Project beneficiaries were quite highly satisfied 5- Project beneficiaries were highly satisfied
14) Materials, information, and presentations suitable for the target group	<ul style="list-style-type: none"> - How did the projects' materials and information present to the target group? - Were all the materials, information, and presentations suitable for the target group? (Assessed from the target groups' perception) 	QL	<ul style="list-style-type: none"> 1- Not suitable or relevant at all 2- Hardly suitable or relevant 3- Fairly suitable and relevant 4- Quite suitable and relevant 5- Well-designed and communicated to the target group

Project Cycle Process	Evaluation Questions/Issues	QT/QL*	The scale of measurements (1 to 5 interval scale)
15) The problems and obstacles in the project management process	<ul style="list-style-type: none"> - What were the problems and obstacles in project management? - If any, define the problem and problem-solving process 	QL	<ul style="list-style-type: none"> 1- None of the problems were solved 2- Minor problems were solved, but most still remained obstacles to the project's achievement 3- Some problems were solved, and the project could proceed, but the expected outputs were not produced 4- Most problems were solved, and the project could proceed, and most of the expected outputs were produced 5- All problems were solved, and the project could proceed; the expected outputs were produced, and the process was monitored as a lesson learned for the future
Output evaluation: measure the immediate effect of the program and alignment with the project objectives.			
16) Project's output	<ul style="list-style-type: none"> - How well did the project achieve its objectives (and sub-objectives)? - Identify the achieved outputs 	QT/ QL	<ul style="list-style-type: none"> 1- None of the objectives were achieved 2- The project objectives were partly achieved (less than 40%) 3- The project objectives were partly achieved (41%-60%) 4- The project objectives were mostly achieved (61%-80%) 5- All objectives were achieved (more than 80%)

Project Cycle Process	Evaluation Questions/Issues	QT/QL*	The scale of measurements (1 to 5 interval scale)
17) Achievement of project objectives	<ul style="list-style-type: none"> - Did all project objectives and indicators meet the targets? - Identify the indicators which met the targets and did not meet the targets 	QT	1- None or few of the indicators meet the target (Less than 20%) 2- 21%- 40% 3- 41-60% 4- 62-80% 5- Most or all indicators meet the targets (more than 80% achievement)
<p>Outcome evaluation: concerned with the long-term effects of the program and generally used to measure the program goal. Consequently, outcome evaluation measures how well the program goal has been achieved.</p>			
18) Measure the achievement of the overall goals	<ul style="list-style-type: none"> - Have the overall program goals been achieved? - Identify the goals that met and did not meet the targets. - Identify visible results or changes arising from the project 	QT	1- None or few of the goals achieved (less than 20%) 2- 21%-40% achieved 3- 41%– 60% achieved 4- 61%-80% achieved 5- All goals achieved (more than 80%)
<p>Specific Indicators (Project-based indicators) The impact of the project on achieving each Sustainable Development Goal related to the project. The impacts cover three dimensions: Environmental, Economic, and Social Impacts.</p>			
Environmental Impacts	-specified for each project-		
Economic Impacts	-specified for each project-		
Social Impacts	-specified for each project-		

Project Cycle Process	Evaluation Questions/Issues	QT/QL*	The scale of measurements (1 to 5 interval scale)
Overall Impact Evaluation:			
20) Measure the project's overall impacts on the progress of SDGs Note: Evaluated from the <i>Specific Indicators</i> or project-level indicators.	How well did the output/outcome of the project facilitate the progress of the SDGs, NDCs, and BCG components?	QL	1- None of the output/outcomes facilitated progress on the SDGs 2- Slightly facilitated 3- Moderately facilitated 4- Mostly facilitated 5- Greatly facilitated
21) Measure the project's overall impacts on the progress of NDCs Note: Evaluated from the <i>Specific Indicators</i> or project-level indicators.	How well did the output/outcome of the project facilitate the progress of the SDGs, NDCs, and BCG components?	QL	1- None of the output/outcomes facilitated progress on the NDCs 2- Slightly facilitated 3- Moderately facilitated 4- Mostly facilitated 5- Greatly facilitated
Sustainability: Continuity of the benefits and impacts. The extent to which the net benefits of the intervention continue or are likely to continue.			
22) The project's net benefits of the intervention continue or are likely to continue	Will the outputs last?	QL	1- Absolutely Not 2- Maybe not 3- Not sure/unclear 4- Very likely 5- Definitely possible

Project Cycle Process	Evaluation Questions/Issues	QT/QL*	The scale of measurements (1 to 5 interval scale)
23) The project's flow of net benefits or the likelihood of net benefits continuing to deliver the outcomes and impacts over the medium and long term.	Do the outcomes have the potential to deliver in the long term?	QL	1- Absolutely not 2- Maybe not 3- Not sure/unclear 4- Very likely 5- Definitely possible

Remark: * QT = Quantitative Indicators and QL = Qualitative Indicators.

Table 2.1 Specific Indicators for Project I: One Tambon One New Theory Agriculture

Expected Output	Output Achievement Indicators	Expected Outcome	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals.	Impacts on SDGs/NDCs Indicators
1. Increase NTA model sustainable farming area	– The number of NTA farming areas increased under the project (in rai)	1) Promote environmentally friendly agricultural production	– Apply circular farming to reduce chemical dependence	<p>Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.</p> <p>Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, help maintain ecosystems, strengthen capacity for adaptation to climate change, extreme weather, drought, flooding, and other disasters, and progressively improve land and soil quality.</p>	<p>2.4.1 Proportion of agricultural area under productive and sustainable agriculture</p> <p>1) Increase of integrated sustainable farmland area (QT)</p>

Expected Output	Output Achievement Indicators	Expected Outcome	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals.	Impacts on SDGs/NDCs Indicators
				<p>Goal 13: Take urgent action to combat climate change and its impacts</p> <p>Target 13.2: Integrate climate change measures into national policies, strategies, and planning</p> <p>NDC's Target of reducing emissions.</p>	<p>13.2.2 Total greenhouse gas emissions per year</p> <p>2) Increase local forest area (QL) estimation with limitations</p>
				<p>Goal 15: Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss</p> <p>Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought, and floods, and strive to achieve a land degradation-neutral world. Target: All (as applicable)</p>	<p>15.3.1 Proportion of land that is degraded over a total land area</p> <p>3) Plant diversity based on household usage rather than single cash crop production (QT)</p>

Expected Output	Output Achievement Indicators	Expected Outcome	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals.	Impacts on SDGs/NDCs Indicators
				<p>Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.</p> <p>Target 2.1: Universal access to safe and nutritious food.</p>	<p>2.1.1 Prevalence of undernourishment</p> <p>4) Improve the level of food self-sufficiency (QT)</p>
2. Increase the water storage area for farmers participating in the project	– Number of water storage areas that increased under the project (in mil. m3)			<p>Goal 6: Ensure availability and sustainable management of water and sanitation for all.</p> <p>Target 6.4: By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.</p>	<p>6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources.</p> <p>5) Level of water stress (QT)</p>

Expected Output	Output Achievement Indicators	Expected Outcome	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals.	Impacts on SDGs/NDCs Indicators
3. Capacity building on NTA farming and sustainable agriculture	– Number of farmers who received NTA-related training under the project	Satisfaction of farmer's occupation	– Satisfaction from self-reliance farming technique	Goal 4: Ensure inclusive and quality education for all and promote lifelong learning Target 4.7: Education for sustainable development and global citizenship	4.7.1 Education on sustainable development and global citizenship 6) Training coursework provides knowledge and skills that promote sustainable agriculture (QL) project documents/ Interviews with project managers/ questionnaires with beneficiaries.
4. NTA farm model plot for learning and scaling up	– Number of NTA farms that can act as learning spots for others				
5. Job creation and income generation in the local area	– Number of jobs created – Income generation in the local area	Farmers have a career, income, and a better quality of life	– Net return from farming	Goal 8: Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all Target 8.1: Sustainable Economic Growth	8.1.1 Annual growth rate of real GDP per capita. 7) Increase household's net return (QT) Financial analysis at farm level

Expected Output	Output Achievement Indicators	Expected Outcome	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals.	Impacts on SDGs/NDCs Indicators
				<p>Target 8.3: Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity, and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services</p>	<p>8.3.1 Proportion of informal employment in nonagricultural employment by sex</p> <p>8) Number of farmers participating in the OTONTAG who were previously unemployed or had poor quality of living (QT)</p>
6. Others Empowerment of women & youth				<p>Goal 5: Achieve gender equality and empower all women and girls</p> <p>Target 5.5: Ensure women’s full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic, and public life</p>	<p>5.5.2 Proportion of women in managerial positions.</p> <p>9) Proportion of women in leading/ managerial positions in implementing the project (QT)</p>

**Table 2.1.1 Summary of OT-ONTAG Project Operating Indicators
(Quantitative: QT/ Qualitative: QL)**

Operating Indicators	Output / Outcome / SDGs	QT or QL	Sources of information	Interview Question Issues
1) Increase of integrated sustainable farmland area	Output #1 Outcome #1 SDG 2.4.1	QT	<i>Project documents</i> <i>Questionnaire survey of beneficiaries</i>	<ul style="list-style-type: none"> • The number of NTA farming areas increased under the project (in rai) • Use of chemical substances such as chemical fertilizer or pesticide (before/after)
2) Increase local forest/tree area (3 forests, 4 benefits)	SDG 13.2.2	QT	<i>Questionnaire survey of beneficiaries</i> <i>Estimates of limitations</i>	<ul style="list-style-type: none"> • Numbers of planted trees during the year 2020 / estimation of Co2 absorption for the next ten years
3) Plant diversity based on household usage rather than mass production	SDG 15.3.1	QT / QL	<i>Questionnaire survey of beneficiaries</i>	<ul style="list-style-type: none"> • What types of trees/plants did you grow? Compared with before/after participating in the project • Fill in by categories (economic trees, fruit trees, herbs, ground cover, ...) • Reason for choosing types of trees (for the lesson learned / policy recommendations)
4) Improve the level of food self-sufficiency	Outcome #2 SDG 2.1.1	QT	<i>Questionnaire survey of beneficiaries</i>	<ul style="list-style-type: none"> • Domestic food consumption – scale 1-10 / before-after – varieties of food consumption – satisfaction • Satisfaction from self-reliance farming technique – scale 1-10 / before-after
5) Level of water stress	Output #2 SDG 6.4.2	QT	<i>Project documents</i> <i>Questionnaire survey of beneficiaries</i>	<ul style="list-style-type: none"> • Number of water storage areas that increased under the project (in mil.m3) • Sufficiency of water usage for the whole year (consumption/agriculture) – scale 1-10 / before-after

Operating Indicators	Output / Outcome / SDGs	QT or QL	Sources of information	Interview Question Issues
6) Training coursework provides knowledge and skills that promote sustainable agriculture	Output #3 Output #4 SDG 4.7.1	QT/ QL	<i>Project documents</i> <i>Interview with project managers</i> <i>Questionnaire survey of beneficiaries</i>	<ul style="list-style-type: none"> • Number of farmers who received NTA-related training under the project • Number of NTA farm model plots • Training course syllabus (length/contents) • Usefulness/ how to improve course syllabus)
7) Increase the household's annual income Note: financial analysis at farm level	Output #5 Outcome #3 SDG 8.1.1	QT	<i>Project documents</i> <i>Questionnaire survey of beneficiaries</i>	<ul style="list-style-type: none"> • Number of jobs created • Income generation in the local area from local employment • Net return for household from farming activities (2021 compared with 2020)
8) Number of farmers participating in the OTONTAG previously unemployed or with poor quality of life	SDG 8.3.1	QT	<i>Project documents</i> <i>Questionnaire survey of beneficiaries</i>	<ul style="list-style-type: none"> • Were you unemployed before? • Did you return to your hometown due to Covid-19? If yes, do you plan to return to work in the city or stay on the farm post-Covid?
9) Proportion of women in leading/ managerial positions in implementing the project	SDG 5.5.2	QT/ QL	<i>Questionnaire</i> <i>Interviews with project managers</i>	<ul style="list-style-type: none"> • Number/proportion of farmer women participating in the project • Roles of women in implementing the project Example of an outstanding case

Table 2.2 Specific Indicators for Project II: Kok Nong Na Model

Expected Output	Output Achievement Indicators	Expected Outcome	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals.	Impacts on SDGs/NDCs Indicators
1. Job creation (temporary 1-year employment contract)	<ul style="list-style-type: none"> – Number of households participating in the project. – Number of participants in the training activities related to KNN practice 	1) Job/employment opportunities and income creation (longer-term employment)	<ul style="list-style-type: none"> – Number of households continuing with KNN practice. – Any income generated from farmland output/reduction of household reduction 	<p>Goal 8: Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all</p> <p>Target 8.1 Sustain per capita economic growth following national circumstances and, in particular, at least 7% per annum GDP growth in the least developed countries 8.3 Promote development-oriented policies</p>	<ul style="list-style-type: none"> 1) Number of participants practicing the Kok Nong Na model previously unemployed or with poor quality of life 2) Increase in the amount of time spent in the fields on various activities 3) Increase in household's annual income 4) Increase in household's annual income growth 5) Proportion of informal employment in total employment by

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Expected Output	Output Achievement Indicators	Expected Outcome	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals.	Impacts on SDGs/NDCs Indicators
				that support productive activities, decent job creation, entrepreneurship, creativity, and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services	sector and gender
2. Participating households receive necessary training and information for Kok Nong Na practice	– Number of households completing the necessary training program for KNN practice	1) Income creation and poverty reduction	– Increasing household income, cutting down on unnecessary household expenses	Goal 8: Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all	

Expected Output	Output Achievement Indicators	Expected Outcome	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals.	Impacts on SDGs/NDCs Indicators
				<p>Target 8.2 Achieve higher levels of productivity of economies through diversification, technological upgrading and innovation, including through a focus on high-value-added and labor intensive sectors</p> <p>8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity, and innovation, and encourage the formalization and growth of micro-, small- and medium-</p>	

Expected Output	Output Achievement Indicators	Expected Outcome	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals.	Impacts on SDGs/NDCs Indicators
				sized enterprises, including through access to financial services	
3. Increase the amount of farmland developed according to the Kok Nong Na guideline	– Number of land plots and areas developed using KNN model agricultural practice	1) Contribution to a better quality of environment such as increasing forest plantation areas according to the Kok Nong Na practice for fresh air and retaining carbon (improved air quality)	- Improve life satisfaction by 1) reduction of family stress financially and non-financially and 2) increasing family time and working together - Satisfaction from project participants concerning self-reliance based on actual income change	Goal 8: Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all Target 8.2 Achieve higher levels of productivity of economies through diversification, technological upgrading and innovation, including through a focus on high value-added and labor intensive sectors Target 8.3 Promote development-	1) Better agriculture mix contributing to better environment compared to larger scale plantation of rice, maize, cassava, etc. 2) Increase in forest area related to previous practice 3) Creation of water supply and household irrigation system for year-round use. 4) Female household participation in the project

Expected Output	Output Achievement Indicators	Expected Outcome	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals.	Impacts on SDGs/NDCs Indicators
				<p>oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services</p> <p>SDG 13: NDC target of GHG NDC target of reduction of emission relative to business as usual</p>	5) Ratio of female decision makers from the project (QT)
4. Enhance sustainable community	– A number of participating households gain important and	1) Creation of households and communities capable of facing	– Improving household financial condition	Goal 5: Achieve gender equality and empower all women and girls	1) Creation of a community communication channel (monthly

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Expected Output	Output Achievement Indicators	Expected Outcome	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals.	Impacts on SDGs/NDCs Indicators
	necessary “new” ways of farming and other agricultural practices and are able to implement them as options to improve their quality of life.	financial and social challenges	<ul style="list-style-type: none"> – Increasing number of households in the community network – Participation of household-sharing activities 	Target 5.5: Ensure women’s full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic, and public life	<ul style="list-style-type: none"> community gathering) for knowledge sharing and public decision-making 2) Creation of a learning center for interested farmers to join the KNN practice 3) Establishment of financial mechanism to generate enough financial needs for public/private water storage maintenance
5. Promote sustainable agriculture	<ul style="list-style-type: none"> – The possibility of improving yield per farming area due to better allocation of farmland for more diversified 	1) Agricultural diversity and, hence, income creation from various sources via risk diversification	<ul style="list-style-type: none"> – Increase in the number of water storage areas according to the guidelines suggested for year-round use 	Goal 11: Make cities and human settlements inclusive, safe, resilient, and sustainable	<ul style="list-style-type: none"> 1) Participating households with better income/financial status 2) Participating households capable of

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Expected Output	Output Achievement Indicators	Expected Outcome	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals.	Impacts on SDGs/NDCs Indicators
	<p>activities does not necessarily imply an increase in total farming output.</p> <ul style="list-style-type: none"> – Increase the water storage area for farmers participating in the project 		<p>under the KNN model</p> <ul style="list-style-type: none"> – Apply circular farming as well as a household irrigation system to reduce cost and chemical dependence 	<p>Target 11.b By 2030, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards including resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and development and implementation, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, with</p>	<p>sharing and supporting others in the community</p> <ul style="list-style-type: none"> 3) Participating households with better quality of life 4) Frequency of health-related problems in a month (average of the previous 6 months) 5) Increased awareness of local cultural heritage from the project (QL)

Expected Output	Output Achievement Indicators	Expected Outcome	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals.	Impacts on SDGs/NDCs Indicators
				holistic disaster risk management at all levels 11.4 Strengthen efforts to protect and safeguard the world's cultural and natural heritage	
6. Food security for households and communities	Self-sufficient as participating households rely less on food from the market (increasing proportion of food cultivated from own farmland and hence, less expenditure on food purchased from markets)	1) Food security (Food self-sufficiency), better long-term health, and smoother income streams over time	<ul style="list-style-type: none"> – Adequate amount of necessary nutrition can be cultivated within the farmland. – Reduce health-related expenses for households 	<p>Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture</p> <p>Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural</p>	<ul style="list-style-type: none"> 1) Ability of food self-sufficiency (having enough to eat without relying on food from the market) 2) Percentage of daily food consumption of self-grown products 3) Frequency of health problems related to food consumption 4) Proportion of agricultural area

Expected Output	Output Achievement Indicators	Expected Outcome	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals.	Impacts on SDGs/NDCs Indicators
				practices that increase productivity and production, help maintain ecosystems, strengthen capacity for adaption to climate change, extreme weather, drought, flooding, and other disasters, and progressively improve land and soil quality	under productive and sustainable agriculture
		2) Environmentally friendly agriculture	- Increase the use of non-chemical substances (fertilizer and pesticides) on farmland, thus reducing the chance of harmful health	Goal 6: Ensure availability and sustainable management of water and sanitation for all Target 6.4: By 2030, substantially	- Annual expenses on chemical use on farmland (fertilizer and pesticides) - Cost of farming compared to the traditional way of farming.

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Expected Output	Output Achievement Indicators	Expected Outcome	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals.	Impacts on SDGs/NDCs Indicators
			impacts on the household and community. - Prevention of farmland quality deterioration	increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	

Table 2.3 Specific Indicators for Project III: Development of Pilot Areas for the Travel Safety Zone

Expected Outputs	Output achievement Indicators	Expected Outcomes	Outcome achievement Indicators	Impacts on SDGs, NDC, and other goals.	Impacts on SDGs/NDC Indicators
<p>1. Develop the management role model for secured tourism areas for tourist safety.</p> <p>2. Develop a knowledge body regarding hygiene and safety for tourism enterprises and communities</p> <p>3. Promote travel safety zones to both Thai and foreign tourists</p> <p>4. Build tourists' confidence.</p>	<p>1) 10,000 tourists have the confidence to travel and create jobs in the target areas</p> <p>2) 500 enterprises have management knowledge relating to Health and safety to create more income</p>	<p>1) Quality of life improvement</p> <p>2) Strengthen communities</p>	<p>1) Number of tourists</p> <p>2) Income Creation</p> <p>3) Community standard for tourist service</p>	<p>8.1 Sustain per capita economic growth by national circumstances and, in particular, at least 7 percent gross domestic product growth per annum in the least developed countries</p> <p>8.2 Achieve higher levels of economic productivity through diversification, technological upgrading, and innovation, including through a focus on high</p>	<p>8.1.1 Annual growth rate of real GDP per capita</p> <p>8.2.1 Annual growth rate of real GDP per employed person</p>

Evaluation of the Impacts of the Thailand Government's 400-billion baht economic and social rehabilitation fund package on sustainable development goals (SDGs), Nationally determined contributions (NDCs), and other global sustainability frameworks.

Expected Outputs	Output achievement Indicators	Expected Outcomes	Outcome achievement Indicators	Impacts on SDGs, NDC, and other goals.	Impacts on SDGs/NDC Indicators
				<p>value-added and labor-intensive sectors</p> <p>8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity, and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services</p> <p>8.9 By 2030, devise and implement</p>	<p>8.3.1 Proportion of informal employment in total employment by sector and sex</p> <p>8.9.1 Tourism direct GDP as a proportion of total GDP and in growth rate</p>

Expected Outputs	Output achievement Indicators	Expected Outcomes	Outcome achievement Indicators	Impacts on SDGs, NDC, and other goals.	Impacts on SDGs/NDC Indicators
				policies to promote sustainable tourism that creates jobs and promotes local culture and products	

Table 2.4 Specific Indicators for Project IV: Upgrading the Economy in the Central-Western Economic Corridor using the BCG model

Expected Outputs	Output achievement Indicators	Expected Outcomes	Outcome Achievement Indicators	Impacts on SDGs, NDC, and other goals.	Impacts on SDGs/NDC Indicators
1. Improve the agricultural production process by applying technology and innovation to reduce both costs and environmental impacts Create value-added along the supply chain by applying the BCG model.	<ol style="list-style-type: none"> 1) Fifty farmers are trained and apply technology to reduce costs and increase productivity 2) Five agricultural precision technologies 3) Five inputs used to improve productivity 4) One-hundred farmers are trained for functional food production or packaging 5) Two companies are partners in R&D 6) Ten processed products 	<ol style="list-style-type: none"> 1) Quality of life improvement 2) Strengthen communities 3) Increase value-added products 4) Job and income creation 	<ol style="list-style-type: none"> 1) Three million baht per year from value-added of functional food or functional ingredient innovation 2) One million baht per year from value-added of eco-friendly packaging 3) 16,100,000 baht per year reduction of imported agricultural chemicals (totally of 241,500,000 per baht for the project period (15 years)) 4) twenty percent income increase 	<p>SDGs</p> <p>2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists, and fishers, including through secure and equal access to land, other productive resources, and inputs, knowledge, financial services, markets and opportunities for value addition and</p>	<p>SDGs</p> <p>2.3.1 Volume of production per labor unit by classes of farming/pastoral/forestry enterprise size</p> <p>2.3.2 Average income of small-scale food producers by sex and indigenous status</p>

Evaluation of the Impacts of the Thailand Government's 400-billion baht economic and social rehabilitation fund package on sustainable development goals (SDGs), Nationally determined contributions (NDCs), and other global sustainability frameworks.

Expected Outputs	Output achievement Indicators	Expected Outcomes	Outcome Achievement Indicators	Impacts on SDGs, NDC, and other goals.	Impacts on SDGs/NDC Indicators
	7) Two eco-friendly packaging		<ul style="list-style-type: none"> from cost reduction 5) Ten percent income increase from by-product 6) One million baht per year from value-added of eco-friendly packaging 7) 1,000 job creation 	<ul style="list-style-type: none"> non-farm employment 5.b Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women 8.2 Achieve higher levels of economic productivity through diversification, technological upgrading, and innovation, including through a focus on high-value-added and labor-intensive sectors 	<ul style="list-style-type: none"> 5.b.1 Proportion of individuals who apply new technology by sex 8.2.1 Annual growth rate of real GDP per employed person

Evaluation of the Impacts of the Thailand Government's 400-billion baht economic and social rehabilitation fund package on sustainable development goals (SDGs), Nationally determined contributions (NDCs), and other global sustainability frameworks.

Expected Outputs	Output achievement Indicators	Expected Outcomes	Outcome Achievement Indicators	Impacts on SDGs, NDC, and other goals.	Impacts on SDGs/NDC Indicators
				<p>8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value</p> <p>9.2 Promote inclusive and sustainable industrialization and, by 2030, significantly raise the industry's share of employment and gross domestic product in line with national circumstances and double its share in the least developed countries</p>	<p>8.5.2 Unemployment rate by sex, age, and persons with disabilities</p> <p>9.2.1 Manufacturing value added as a proportion of GDP and per capita*</p> <p>9.2.2 Manufacturing employment as a proportion of total employment*</p>

Evaluation of the Impacts of the Thailand Government's 400-billion baht economic and social rehabilitation fund package on sustainable development goals (SDGs), Nationally determined contributions (NDCs), and other global sustainability frameworks.

Expected Outputs	Output achievement Indicators	Expected Outcomes	Outcome Achievement Indicators	Impacts on SDGs, NDC, and other goals.	Impacts on SDGs/NDC Indicators
				<p>9.3 Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets</p> <p>Indicators</p> <p>9.b - Support domestic technology development, research, and innovation in developing countries, including by ensuring a conducive policy environment for, among other things, industrial</p>	<p>9.3.1 Proportion of small-scale industries in total industry value-added*</p> <p>9.b.1 Proportion of medium and high-tech industry value added in total value-added*</p>

Evaluation of the Impacts of the Thailand Government's 400-billion baht economic and social rehabilitation fund package on sustainable development goals (SDGs), Nationally determined contributions (NDCs), and other global sustainability frameworks.

Expected Outputs	Output achievement Indicators	Expected Outcomes	Outcome Achievement Indicators	Impacts on SDGs, NDC, and other goals.	Impacts on SDGs/NDC Indicators
				<p>diversification and value addition to commodities -Thailand NDC 4.2, technology development and transfer</p> <p>12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling, and reuse</p> <p>12.a Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production</p>	<p>12.5.1 National recycling rate, tons of material recycled*</p> <p>12.a.1 Amount of support to developing countries on research and development for sustainable consumption and production and environmentally sound technologies</p>

Evaluation of the Impacts of the Thailand Government's 400-billion baht economic and social rehabilitation fund package on sustainable development goals (SDGs), Nationally determined contributions (NDCs), and other global sustainability frameworks.

Expected Outputs	Output achievement Indicators	Expected Outcomes	Outcome Achievement Indicators	Impacts on SDGs, NDC, and other goals.	Impacts on SDGs/NDC Indicators
				17.7 Promote the development, transfer, dissemination, and diffusion of environmentally sound technologies to developing countries on favorable terms, including concessional and preferential terms, as mutually agreed	17.7.1 Total amount of approved funding for developing countries to promote the development, transfer, dissemination, and diffusion of environmentally sound technologies

Note: The impact evaluation covers the only sub-project of five microorganisms; thus, the evaluation will not cover all of the proposed indicators.
 * These indicators are not included in this evaluation.

Table 2.5 Specific Indicators for Project V: Cotton Valley Creation

Expected Outputs	Output Achievement Indicator	Expected Outcomes	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals	Impacts to SDGs/NDCs Indicators
1. A total of 150 Cotton Valley Creation trained and educated entrepreneurs.	Number of trained and educated entrepreneurs.	1) Export market expansion	Channel (or platform) of the export market	<p>Goal 12: Ensure sustainable consumption and production patterns</p> <p>Target 12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their lifecycle by agreed international frameworks and significantly reducing their release to air, water, and soil to minimize their adverse impacts on human health and the environment</p>	<p>12.4.2 (a) Hazardous waste generated per capita; and (b) proportion of hazardous waste treated, by type of treatment</p> <p>1. Reduced amounts of chemical/toxic substances in the project (QT)</p> <p>Expected Impact on SDGs Project level: 4, likely moderate impact SDG Target level: 3, likely no impact</p>

Expected Outputs	Output Achievement Indicator	Expected Outcomes	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals	Impacts to SDGs/NDCs Indicators
2. A total of 50 Cotton Valley Creation pilot products.	Number of value-added cotton handicraft products	2) Increase value-added products based on local culture, wisdom, and identity that meet market needs.	High-quality cotton handcrafted from Loei Province is widely recognized in the market.	<p>Goal 8: Promote sustained, inclusive, and sustainable economic growth, full and productive employment and decent work for all</p> <p>Target 8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity, and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services</p>	<p>8.3.1 Proportion of informal employment in non-agriculture employment by sex</p> <p>2. Increases numbers in informal employment (QT)</p> <p>Expected Impact on SDGs Project level: 4, likely moderate impact SDG Target level: 3, likely no impact</p>

Expected Outputs	Output Achievement Indicator	Expected Outcomes	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals	Impacts to SDGs/NDCs Indicators
3. A total of 9 Cotton Valley Creation tourism landmarks (overall area covering 100 rai)	Number of tourism landmarks	3. Job and income creation leading to self-reliance	Satisfaction from project participants concerning self-reliance based on actual income change	<p>Goal 8: Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all</p> <p>Target 8.9 By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products</p>	<p>8.9.1 Tourism direct GDP as a proportion of total GDP and in growth rate</p> <p>3. Increased tourism related to the project (QL)</p> <p>Expected Impact on SDGs Project level: 3, likely no impact SDG Target level: 3, likely no impact</p>

Expected Outputs	Output Achievement Indicator	Expected Outcomes	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals	Impacts to SDGs/NDCs Indicators
4. A total of 200 employments	Number of employees	4. Linkage to the tourism industry	Increased numbers of tourists to tourism landmarks in the project	<p>Goal 11: Make cities and human settlements inclusive, safe, resilient, and sustainable</p> <p>Target 11.4 Strengthen efforts to protect and safeguard the world’s cultural and natural heritage.</p>	<p>11.4.1 Total per capita expenditure on the preservation, protection, and conservation of all cultural and natural heritage by the source of funding (public, private), type of heritage (cultural, natural), and level of government (national, regional, and local/municipal)</p> <p>4. Increased awareness of local cultural heritage from the project (QL)</p> <p>Expected Impact on SDGs Project level: 4, likely moderate impact SDG Target level: 4, likely moderate impact</p>

Expected Outputs	Output Achievement Indicator	Expected Outcomes	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals	Impacts to SDGs/NDCs Indicators
		5. Economic stimulation in Loei Province.	Increased GDP per capita in Loei Province	<p>Goal 5: Achieve gender equality and empower all women and girls</p> <p>Target 5.5: Ensure women’s full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic, and public life</p>	<p>5.5.2 The proportion of women in managerial positions</p> <p>5. Ratio of female decision makers from the project (QT)</p> <p>Expected Impact on SDGs Project level: 4, likely moderate impact SDG Target level: 3, likely no impact</p>

Table 2.5.1 Summary: SDGs (Goals 5, 8, 11, 12) with 5 Project-level Indicators (QT/QL)

Domain	Topic	SDG: Goal and Target / NDC Target	SDGs Indicator / <i>Operating Indicator</i>
Environment	Chemical and Waste Reduction	<p>Goal 12: Ensure sustainable consumption and production patterns</p> <p>Target 12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their lifecycle by agreed international frameworks and significantly reducing their release to air, water, and soil to minimize their adverse impacts on human health and the environment</p>	<p>12.4.2 (a) Hazardous waste generated per capita; and (b) proportion of hazardous waste treated, by type of treatment</p> <p>1. <i>Reduced amounts of chemical/toxic substances in the project (QT)</i></p>
Economic	Green jobs	<p>Goal 8: Promote sustained, inclusive, and sustainable economic growth, full and productive employment and decent work for all</p> <p>Target 8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services</p>	<p>8.3.1 Proportion of informal employment in non-agricultural employment by sex</p> <p>2. <i>Increase in numbers in informal employment (QT)</i></p>

Domain	Topic	SDG: Goal and Target / NDC Target	SDGs Indicator / <i>Operating Indicator</i>
	Sustainable tourism	<p>Goal 8: Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all</p> <p>Target 8.9 By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products</p>	<p>8.9.1 Tourism direct GDP as a proportion of total GDP and in growth rate</p> <p>3. Increased tourism related to the project (QL)</p>
Social	Cultural Heritage	<p>Goal 11: Make cities and human settlements inclusive, safe, resilient, and sustainable</p> <p>Target 11.4 Strengthen efforts to protect and safeguard the world’s cultural and natural heritage</p>	<p>11.4.1 Total per capita expenditure on the preservation, protection, and conservation of all cultural and natural heritage by the source of funding (public, private), type of heritage (cultural, natural), and level of government (national, regional, and local/municipal).</p> <p>4. Increased awareness of local cultural heritage from the project (QL)</p>

Domain	Topic	SDG: Goal and Target / NDC Target	SDGs Indicator / <i>Operating Indicator</i>
	Empowerment of women	<p>Goal 5: Achieve gender equality and empower all women and girls</p> <p>Target 5.5: Ensure women’s full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic, and public life</p>	<p>5.5.2 The proportion of women in managerial positions</p> <p><i>5. Ratio of female decision makers from the project (QT)</i></p>

Table 2.6 Specific Indicators for Project VI: Processing of Solar-powered Dried Bananas to Generate Income for the Community

Expected Outputs	Output Achievement Indicators	Expected Outcomes	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals	Impacts on SDGs/NDCs Indicators
1. 200 households from communities in Phang-Nga benefit from greenhouse building and materials for baking solar-dried bananas	Number of households benefiting from the project	1) The Office of Non-Formal and Informal Education, Phang Nga Province, has sun-dried banana products in the market.	There is an end product of a signature solar-dried banana product from the province.	<p>Goal 12: Ensure sustainable consumption and production patterns</p> <p>Target 12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses.</p>	<p>12.3.1 (a) Food loss index and (b) food waste index</p> <p>2) Decrease of food loss and food waste (QT/OL)</p> <p>Expected Impact on SDGs Project level: 4, likely moderate impact SDG Target level: 3, likely no impact</p>

Expected Outputs	Output Achievement Indicators	Expected Outcomes	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals	Impacts on SDGs/NDCs Indicators
2. Increased income of 3,456,000 Baht in Fiscal Year 2021	Amount of increased income resulting from the project	2) A professional training and knowledge center for people in the community and target groups (Strengthened communities and local development)	Follow-up on successful training activities from the communities participating in the project, leading to local development	<p>Goal 7: Ensure access to affordable, reliable, sustainable, and modern energy for all</p> <p>Target 7.b By 2030, expand infrastructure and upgrade technology to supply modern and sustainable energy services for all in developing countries, particularly least developed countries, small island developing states, and landlocked developing countries, by their respective programs of support.</p>	<p>7.b.1 Installed renewable energy-generating capacity in developing countries (in watts per capita)</p> <p>3) Installed renewable energy-generating capacity in the project (watts per project) (QT/QL)</p> <p>Expected Impact on SDGs Project level: 4, likely moderate impact SDG Target level: 3, likely no impact</p> <p>*The greenhouse building uses both direct solar heating and solar panels. Therefore, the installed renewable energy-generating capacity of the project should be identifiable.</p>

Expected Outputs	Output Achievement Indicators	Expected Outcomes	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals	Impacts on SDGs/NDCs Indicators
		3) Phang Nga Province: can drive essential economic development to support and restore the economy from the impact of COVID-19 (Quality of life improvement)	The consequent increase in income of the communities participating in the project	<p>Goal 8: Promote sustained, inclusive, and sustainable economic growth, full and productive employment and decent work for all</p> <p>Target: 8.3: Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity, and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services</p>	<p>8.3.1 Proportion of informal employment in non-agricultural employment by sex</p> <p>4) Increase in numbers in informal employment (QT)</p> <p>Expected Impact on SDGs Project level: 4, likely moderate impact SDG Target level: 3, likely no impact</p>

Expected Outputs	Output Achievement Indicators	Expected Outcomes	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals	Impacts on SDGs/NDCs Indicators
		4) Demonstration and promotion of renewable energy	Awareness, understanding, and knowledge of the target groups participating in the project and not participating in the project on the topic of clean and renewable energy	<p>Goal 8: Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all</p> <p>Target 8.2: Achieve higher levels of economic productivity through diversification, technological upgrading, and innovation, including through a focus on high-value-added and labor-intensive sectors</p>	<p>8.2.1 Annual growth rate of real GDP per employed person</p> <p>5) Increase in the number of value-added products from the project (QT)</p> <p>Expected Impact on SDGs Project level: 4, likely moderate impact SDG Target level: 3, likely no impact</p>

Expected Outputs	Output Achievement Indicators	Expected Outcomes	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals	Impacts on SDGs/NDCs Indicators
				<p>Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture</p> <p>Target 2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists, and fishers, including through secure and equal access to land, other productive resources, and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment</p>	<p>2.3.2 Average income of small-scale food producers by sex and indigenous status</p> <p>6) Increase in average income increase of small-scale food producers (QT)</p> <p>Expected Impact on SDGs Project level: 4, likely moderate impact SDG Target level: 3, likely no impact</p>

Expected Outputs	Output Achievement Indicators	Expected Outcomes	Outcome Achievement Indicators	Impacts on SDGs, NDCs, and Other Goals	Impacts on SDGs/NDCs Indicators
				<p>Goal 5: Achieve gender equality and empower all women and girls</p> <p>Target 5.5: Ensure women’s full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic, and public life</p>	<p>5.5.2 The proportion of women in managerial positions</p> <p>7. Ratio of female decision makers from the project (QT)</p> <p>Expected Impact on SDGs Project level: 4, likely moderate impact SDG Target level: 3, likely no impact</p>

Table 2.6.1 Summary: SDGs (Goals 2, 8, 7, 12) with 6 Project-level Indicators (QT/QL)

Domain	Topic	SDG: Goal and Target / NDC Target	SDGs Indicator / Operating Indicator
Environment	Food Waste	<p>Goal 12: Ensure sustainable consumption and production patterns</p> <p>Target 12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses.</p>	<p>12.3.1 (a) Food loss index and (b) food waste index</p> <p>2) Decrease in food loss and food waste (QT/OL)</p>
	Clean Energy	<p>Goal 7: Ensure access to affordable, reliable, sustainable, and modern energy for all</p> <p>Target 7. b By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing states, and landlocked developing countries, by their respective programs of support.</p>	<p>7.b.1 Installed renewable energy-generating capacity in developing countries (in watts per capita)</p> <p>3) Installed renewable energy-generating capacity in the project (watts per project) (QT)</p>
Economic	Green jobs	<p>Goal 8: Promote sustained, inclusive, and sustainable economic growth, full and productive employment and decent work for all</p> <p>Target: 8.3: Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services</p>	<p>8.3.1 Proportion of informal employment in non-agricultural employment by sex</p> <p>4) Increased numbers in informal employment (QT)</p>

Domain	Topic	SDG: Goal and Target / NDC Target	SDGs Indicator / Operating Indicator
	Creation of income/ economic growth	<p>Goal 8: Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all</p> <p>Target 8.2: Achieve higher levels of economic productivity through diversification, technological upgrading, and innovation, including through a focus on high value-added and labor-intensive sectors.</p>	<p>8.2.1 Annual growth rate of real GDP per employed person</p> <p>5) Increased numbers of value-added products from the project (QT)</p>
Social	Food security/ income security	<p>Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture</p> <p>Target 2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists, and fishers, including through secure and equal access to land, other productive resources, and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment.</p>	<p>2.3.2 Average income of small-scale food producers by sex and indigenous status</p> <p>6) Average income increase for small-scale food producers (QT)</p>
	Empowerment of women	<p>Goal 5: Achieve gender equality and empower all women and girls</p> <p>Target 5.5: Ensure women’s full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic, and public life</p>	<p>5.5.2 Proportion of women in managerial positions</p> <p>7. Ratio of female decision makers from the project (QT)</p>

5.2 Data Collection

The data collection process involved reviewing project documents and related records and collecting primary data through questionnaire surveys, in-depth interviews, and focus groups. Information was gathered from project stakeholders, including officials from responsible government agencies, the project manager and team members, direct project beneficiaries, and those affected by the project.

- *Project documents and related records* were reviewed to ascertain the project background and characteristics and to conduct the initial project cycle and output/outcome evaluation.
- *In-depth interviews* were conducted with authorized officials of the central agencies responsible for each project.
- *In-depth interviews or focus groups* were conducted with the local project manager/officials involved in the project (i.e., project leader/team in the area)
- *Survey questionnaires* were used with the direct project beneficiaries, those potentially affected by the project, and non-direct beneficiaries.

Table 3 Data Collection Instruments, Informants, and Evaluation Issues

Instruments	Target Groups	Informants	Evaluation Issues
Structured Interviews	Responsible Government Agencies	<p>Project I: OT-ONTAG Agricultural Extension Office</p> <p>Project II: Kok Nong Na Community Development Department</p> <p>Project III: Travel Safety Ministry of Tourism and Sports</p> <p>Project IV: BCG Thailand Institute of Scientific and Technological Research</p> <p>Project V: Cotton Valley Loei Provincial Community Industry Office, Ministry of Industry</p> <p>Project VI: Solar-powered Dried Bananas Office of Non-Formal and Informal Education, Ministry of Education</p>	<p>Project Evaluation</p> <ul style="list-style-type: none"> - Output/Outcome Accomplishment - Project Efficiency - Lessons Learned Process in Project Design/Project Planning & Analysis/Project Management <p>Impact on SDGs</p> <p>Cost-Benefit Analysis</p>
	Project Managers/ Team members		<p>Project Evaluation</p> <ul style="list-style-type: none"> - Outputs/Outcome Accomplishment - Project Efficiency - Lessons Learned Process in Project Design/Project Planning & Analysis/Project Management <p>Impact on SDGs</p> <p>Cost-Benefit Analysis</p>

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Instruments	Target Groups	Informants	Evaluation Issues
	Local officials/NGOs related to the project		Project Evaluation <ul style="list-style-type: none"> - Output/Outcome Accomplishment - Project Efficiency - Lesson Learned Process in Project Design/Project Planning & Analysis/Project Management Impact on SDGs Cost-Benefit Analysis
Survey Questionnaires:	Project's direct beneficiaries		Project Evaluation <ul style="list-style-type: none"> - Output/Outcome Accomplishment - Project Efficiency - Lesson Learned Process in Project Design/Project Planning & Analysis/Project Management Impact on SDGs Cost-Benefit Analysis
	Members of the local community affected by the project		A descriptive cost-benefit analysis (be greener and more inclusive)
Focus Group	Relevant Stakeholders		To get feedback and examine the critical results of the study.

5.3 Data Analysis

The data analysis in this study employed both qualitative and quantitative approaches. Each project evaluator scored each evaluation criterion mentioned above on a 1-5 level Likert scale, with supporting evidence and reasons provided. Two analysis frameworks were used to assess the selected projects: multi-criteria decision analysis (MCDA) and descriptive cost-benefit analysis (CBA).

5.3.1 Multi-Criteria Decision Analysis (MCDA)

The purpose of MCDA is to provide an overall ordering of options. Each option might serve several objectives, and no one option will be best for all objectives. MCDA is a way to analyze options that have mixed characteristics in terms of monetary and non-monetary objectives. Consequently, MCDA might solve the limitation of cost-benefit analysis; several impacts of the objectives cannot be quantified on a scale of monetary values, such as building a network of people in the community. However, MCDA must develop the practical design of processes by obtaining inputs from various professionals and being monitored by independent experts. For example, the processes include identifying key stakeholders' objectives, informing all value judgments publicly, analyzing as many crucial problems as possible, obtaining information from professionals, and communicating the analysis to stakeholders. MCDA is a popular approach and applied in several fields, such as private and public project analysis, material selection and design, or even the evaluation of brain cancer treatment techniques (Department for Communities and Local Government, 2009; Jahan et al., 2016; Uzun Ozsahin et al., 2021).

In general, there are eight steps involved in applying MCDA (Department for Communities and Local Government, 2009):

- Step 1: Establish the decision context.
- Step 2: Identify the options to be appraised.
- Step 3: Identify objectives and criteria.
- Step 4: Assess the value associated with the consequences of each option for each criterion (Scoring).
- Step 5: Assign weights for each criterion to reflect their relative importance to the decision (Weighting).
- Step 6: Derive an overall value by combining the weights and scores for each option (Performance Score).
- Step 7: Examine the results.
- Step 8: Sensitivity analysis².

² This step is not in the scope of this study.

From the above steps, the matrix used for MCDA is as follows:

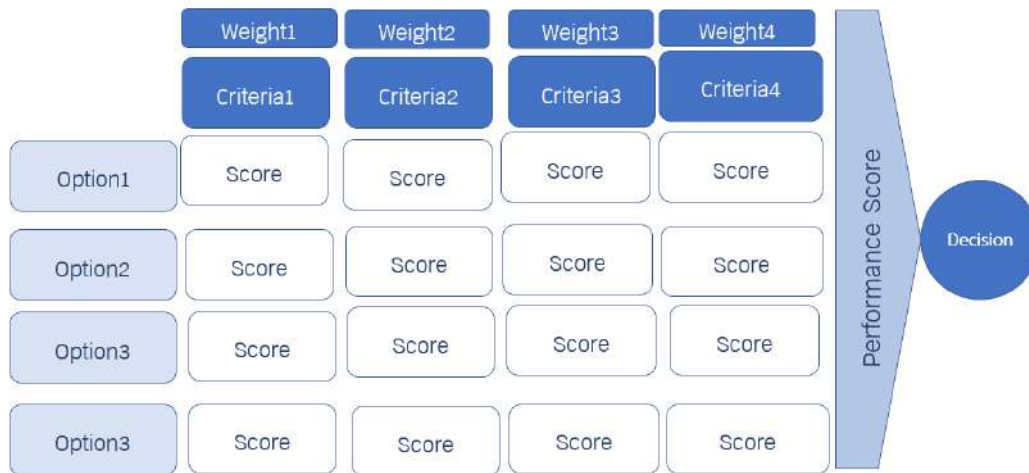


Figure 3 Matrix for MCDA

MCDA was applied in this report to evaluate the impacts of six projects under the Thai government's 400-billion-baht Economic and Social Rehabilitation Fund. The options discussed in the report were (1) the business-as-usual option (continuing the project) and (2) the option of making the projects greener and more inclusive. The criteria considered for each project differed; however, some criteria were standard. Examples of common criteria were costs and job creation. Moreover, the scope of this report did not cover sensitivity analysis (Step 8).

A Framework of Analysis

To analyze the data, the set of evaluations was grouped according to the OECD DAC Network on Development Evaluation (EvalNet). The OECD has defined six evaluation criteria: relevance, coherence, effectiveness, efficiency, impact, and sustainability, as well as two principles for their use. These criteria provide a normative framework used to determine the merit or worth of an intervention (policy, strategy, program, project, or activity). They serve as the basis upon which evaluative judgments are made³. This study has applied and modified the OECD evaluation concept and groups the set of evaluation criteria into five dimensions, as shown in Figure 4.

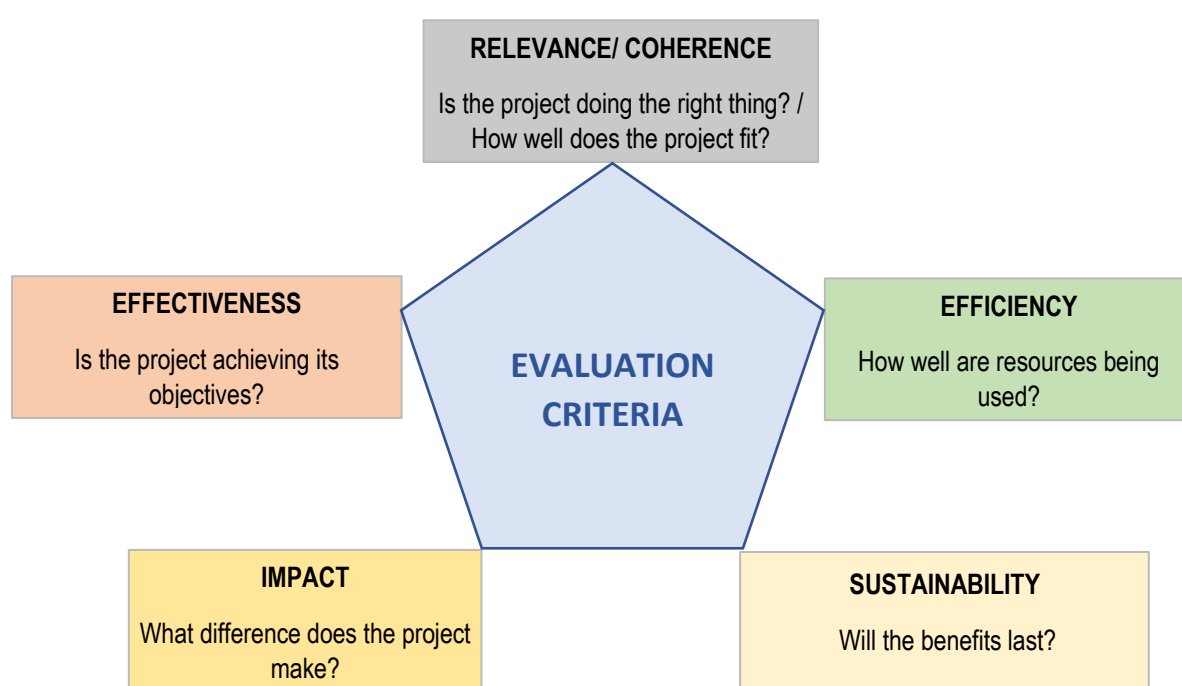


Figure 4 A Normative Framework Used to Determine the Worth of an Intervention
(adapted from the OECD evaluation criteria concept)

1) **Relevance/Coherence** covers issues related to the questions: Is the intervention doing the right things? And how well does the project fit? It examines the extent to which the intervention objectives and design respond to beneficiaries' needs, as well as global, country, and partner/institution needs, policies, and priorities, and continues to do so if circumstances change. Additionally, it investigates the compatibility of the intervention with other interventions in a country, sector, or institution.

³ For more details, please visit OECD.

<https://www.oecd.org/dac/evaluation/daccriteriaforevaluatingdevelopmentassistance.htm>

Evaluation of the Impacts of the Thailand Government's 400-billion baht economic and social rehabilitation fund package on sustainable development goals (SDGs), Nationally determined contributions (NDCs), and other global sustainability frameworks.

2) **Effectiveness** covers questions such as “Is the intervention achieving its objectives?” It assesses the extent to which the intervention has achieved or is expected to achieve its objectives and results, including any differential results across groups.

3) **Efficiency** addresses the issue of “How well are resources being used?” The extent to which the intervention delivers, or is likely to deliver, results in an economical and timely manner.

4) **Impact** deals with the question, “What difference does the intervention make?” It examines the extent to which the intervention has generated or is expected to generate significant positive or negative, intended or unintended, higher-level effects.

5) **Sustainability** focuses on the topic of “Will the benefits last?” It assesses the extent to which the net benefits of the intervention continue or are likely to continue.

Weighting Determination

From these five dimensions, the set of evaluation criteria addressing the project cycle process, outputs/outcomes, and impacts, as mentioned above, have been grouped into each dimension with equal weight determined for each dimension. This is except for the impact criteria, which indicates a higher weight for the economic impact due to the primary objectives of the Economic Rehabilitation package focusing more on post-COVID-19 economic recovery. Table 4 indicates the weighting determination for each dimension of the evaluation criteria.

Table 4 Weighting Determination for the Evaluation Criteria

	Evaluation Criteria	Weight	Total Score
Relevance/ Coherence	- Project Design (5 items) / - Planning (5 items)	20%	100
Efficiency	- Project Implementation (5 items)	20%	100
Effectiveness	- Overall Output (2 items) / - Outcome (1 items)	20%	100
Impact	- Impacts on SDGs and NDC - Environmental (5%) - Economic (10%) - Social (5%)	20%	100
Sustainability	- Continuity of the benefits and impacts	20%	100
Overall Evaluation		100%	500

5.3.2 The Cost-benefit Analysis Framework

Complementing the project's value-for-money analysis, a descriptive cost-benefit or financial analysis was conducted by comparing two scenarios: (i) continuing to implement the projects as they are (business-as-usual) and (ii) making the projects greener and more inclusive.

The objective of the project's value-for-money analysis, using a descriptive cost-benefit or financial analysis, is to demonstrate whether the benefits of making the projects greener outweigh the cost. Therefore, the analysis helps policymakers see the benefits of project expansion in a greener and more inclusive manner, motivating them to adopt green recovery measures or policy initiatives.

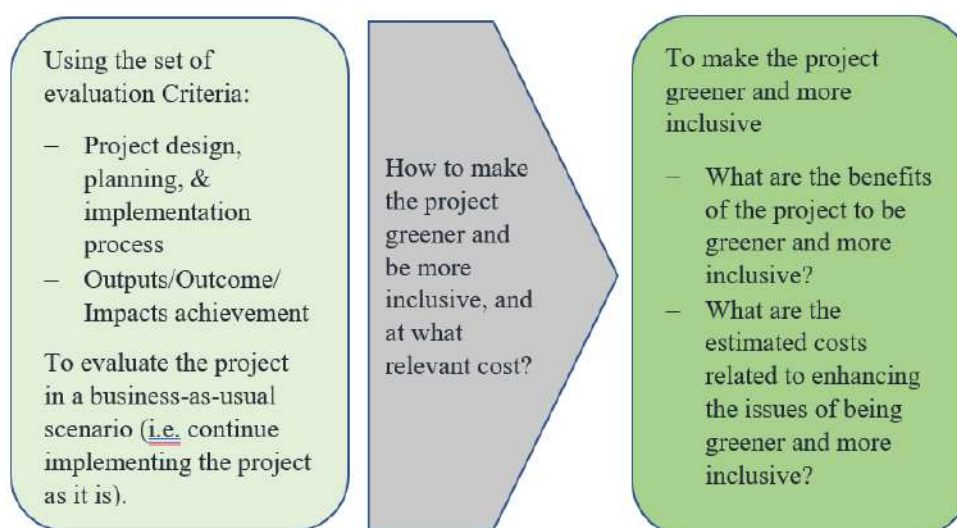


Figure 5 A Descriptive Cost-Benefit Analysis Framework

To define the project as greener and more inclusive and to conduct the cost-benefit analysis, each selected project needs to determine the greener and more inclusive scenario based on the SDGs framework. For example, to achieve higher outputs/outcomes/impacts, the action could be:

- adjust the project design, planning, and implementation process to make the project greener and more inclusive, and
- expand the beneficiaries, target groups, or the implemented area

6. RESULTS AND TECHNICAL ADVICE PROVISION

Data were gathered from the project sites, responsible agencies, and other stakeholders to assess the impacts of the government’s economic and social recovery projects on key selected SDGs, NDCs, and other global sustainability frameworks. Each project's evaluation report was developed by detailing the project's attributes/background, objectives, activities, and output/outcome achievements. The research team responsible for each project then scored each evaluation criterion on a scale of 1-5 based on the available information. Using the determined weight for each dimension, relevance/coherence, efficiency, effectiveness, impact, and sustainability were calculated, as well as the overall evaluation score. Each project evaluation report was presented in Annex II.

Table 5 Each Project’s Total Score in each evaluation dimension and Overall Evaluation

Evaluation Criteria		Weight	Total Score	OT-ONTAG	KNN	Travel Safety Zone	BCG	Cotton Valley	Solar Dried Banana
RELEVANCE/ COHERENCE	Project Design/Planning	20%	100	70.00	70.00	66.00	76.00	68.00	62.00
EFFICIENCY	Project Implementation	20%	100	80.00	80.00	88.00	80.00	88.00	64.00
EFFECTIVENESS	Overall Output / Outcome	20%	100	70.00	80.00	80.00	100.00	100.00	70.00
IMPACT	Impacts on SDGs and NDC	20%	100	77.50	78.75	31.67	53.57	67.50	52.50
SUSTAINABILITY	Continuity of the benefits and impacts	20%	100	60.00	70.00	20.00	80.00	80.00	70.00
OVERALL EVALUATION		100%	500	357.50	378.75	285.67	389.57	403.50	318.50

Remark: On the BCG project, this part of the assessment section is solely under the supervision of UNIDO and has no association with UNDP.

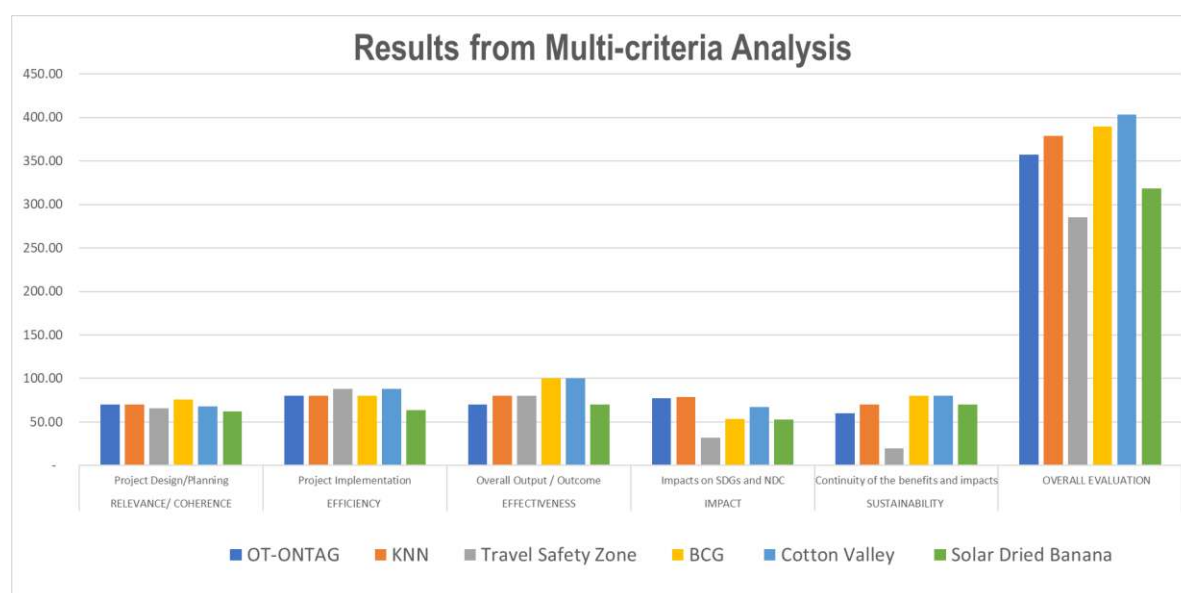


Figure 6 The result of the Multi-Criteria Decision Analysis (MCDA)

Using the determined evaluation criteria, the results, as shown in Table 5 and Figure 6, indicated that most of the selected projects under the 400 billion Baht rehabilitation package had moderate performance, with scores higher than 300 (about 60% and higher), except the “Travel Safety Zone” project, which shows sighting lower performance. The results quite obviously pointed out that the aspects of “Impact on SDGs and NDC” and “Sustainability” (the continuity of benefits and impacts) had a relatively lower score compared to the other aspects of “Project Cycle Process” (Project Design, Planning, and Implementation). Due to the projects’ primary focus on economic recovery after the COVID-19 outbreak, their objectives might be partially linked to global goals such as the Sustainable Development Goals (SDGs) and National Determined Contribution (NDC). However, they are not primarily focused on those.

The selected projects have performed reasonably well after a close evaluation of the project cycle process, starting from the design, planning, and implementation. Even though the project’s objectives were laid out top-down by the responsible government agencies, with some input gathered from local or rural officers who were not directly or minimally involved with the target groups, the criteria and qualifications of target groups were appropriate in response to the project objectives. Project planning and analysis are clearly defined and coherent with the project outputs and outcomes. The project’s activities cover all project deliverables, with a clearly defined technical analysis related to those activities. Additionally, the project’s organization and structure are described, along with the project activities, which serve as an internal risk management mechanism. From these aspects, all selected projects have demonstrated a moderate to high achievement rate of the project-determined outputs and outcomes. However, one observation in the planning process was that some selected projects had no evidence of value-for-money analysis before implementation due to a rush in approval and budget disbursement aiming at economic recovery.

Even though there were limitations on SDGs and NDC impact estimates in the project design and planning process, the selected projects’ objectives, by nature, could impact the SDGs and NDC in all environmental, economic, and social aspects. Table 6 summarizes each project’s impact on the SDGs and NDC. Some of the selected projects, namely OT-ONTAG and KNN, have impacts covering all sustainability domains, which are both agricultural-based projects; however, the rest did not address the environmental and social domains as much, especially the travel safety zone project. Moreover, project sustainability or the continuation of benefits and impacts is crucial because most projects take a long time for the benefit to come to fruition. Thus, policy continuity and certain legal and budgetary obligations for continued support from government agencies should be seriously considered.

Moreover, each selected project evaluated its value for money through a financial or descriptive cost-benefit analysis. It was found that every project demonstrated that the benefits of making the projects greener and more inclusive would outweigh the costs based

on the SDGs framework. Some projects might have more obvious benefits on the environmental and social sides than those on the economic side; however, some had clear benefits in every aspect of sustainable development. Nevertheless, the sustainability of the projects in terms of continuing and expanding their benefits remains an issue.

In addition, the expert teams exchanged some information and provided technical guidance during interviews and site visits/meetings with project responsible teams, stakeholders, and beneficiaries. The guidance covered the concept of SDGs and NDC-aligned project development and management, resource efficiency, and sustainability of each project's activities. From the data analysis, along with comments and opinions from a consultation workshop with project-responsible teams, stakeholders, beneficiaries, and other stakeholders, the overall policy guidance and recommendations have been developed and are presented in the next section. This section is divided into two parts. Firstly, the general recommendations on the project cycle process, outputs, outcomes, and impacts on SDGs, NDC, and sustainability. Secondly, the overall policy guidance and recommendations to assist the government and policymakers in developing future SDGs and NDC-aligned policies and recovery packages address the main issues, including 1) Project cycle process improvement, 2) Capacity building, 3) Research and innovation towards SDGs, NDC, and BCG models, 4) Transformative partnership, and 5) Financial sustainability.

Table 6 Summary of Each Project’s Impact on SDGs (based on the evaluation score on each project’s specific indicator) (Goal 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, & 15)

Domain	SDG: Goal and Target / NDC	Project					
		OT-ONTAG	KNN	Travel Safety Zone	BCG*	Cotton Valley	Solar dried bananas
ENVIRONMENT	Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, help maintain ecosystems, strengthen capacity for adaptation to climate	✓✓✓✓	✓✓✓✓				

Domain	SDG: Goal and Target / NDC	Project					
		OT- ONTAG	KNN	Travel Safety Zone	BCG*	Cotton Valley	Solar dried bananas
	change, extreme weather, drought, flooding, and other disasters, and progressively improve land and soil quality 2.4.1 Proportion of agricultural area under productive and sustainable agriculture						
	Goal 6: Ensure availability and sustainable management of water and sanitation for all Target 6.4: By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity 6.4.2 Lower level of water stress	✓✓✓✓	✓✓✓✓✓				
	Goal 7: Ensure access to affordable, reliable, sustainable, and modern energy for all Target 7. b By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least						✓✓✓✓

Domain	SDG: Goal and Target / NDC	Project					
		OT- ONTAG	KNN	Travel Safety Zone	BCG*	Cotton Valley	Solar dried bananas
	developed countries, small island developing States, and landlocked developing countries, by their respective programs of support 7.b.1 Installed renewable energy-generating capacity in developing countries (in watts per capita)						
	Goal 12: Ensure sustainable consumption and production patterns Target 12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses.						✓✓✓
	Target 12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle by agreed international frameworks and significantly reduce their release to air, water and soil to minimize their adverse impacts on human health and the environment 12.4.2 (a) Hazardous waste generated per				✓✓✓	✓✓✓	

Domain	SDG: Goal and Target / NDC	Project					
		OT- ONTAG	KNN	Travel Safety Zone	BCG*	Cotton Valley	Solar dried bananas
	capita; and (b) proportion of hazardous waste treated, by type of treatment						
	<p>Goal 13: Take urgent action to combat climate change and its impacts</p> <p>Target 13.2: Integrate climate change measures into national policies, strategies, and planning</p> <p>NDC Target of reducing emission: 13.2.2 Total greenhouse gas emissions per year (Increase local forest/trees area)</p>	✓✓✓✓	✓✓✓✓				
	<p>Goal 15: Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss</p> <p>Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought, and floods, and strive to achieve a land degradation-neutral world Target: All (as applicable)</p> <p>15.3.1 Proportion of land that is degraded over total land area (Restore degraded</p>	✓✓✓✓	✓✓✓✓				

Domain	SDG: Goal and Target / NDC	Project					
		OT-ONTAG	KNN	Travel Safety Zone	BCG*	Cotton Valley	Solar dried bananas
	land and soil by integrated farming)						
ECONOMIC	Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture Target 2.1: Universal access to safe and nutritious food 2.1.1 Prevalence of undernourishment (Improve access to safe and nutritious food)	✓✓✓✓	✓✓✓✓				
	Target 2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists, and fishers, including through secure and equal access to land, other productive resources, and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment 2.3.1 Volume of production per labor unit by classes of farming/pastoral/forestry enterprise size				✓✓✓✓		
	Goal 8: Promote sustained, inclusive,	✓✓✓✓	✓✓✓✓				

Domain	SDG: Goal and Target / NDC	Project					
		OT-ONTAG	KNN	Travel Safety Zone	BCG*	Cotton Valley	Solar dried bananas
	and sustainable economic growth, full and productive employment and decent work for all Target 8.1 Sustain per capita economic growth in accordance with national circumstances, and in particular at least 7% per annum GDP growth in the least developed countries 8.1.1 Annual growth rate of real GDP per capita (Increase household's annual income)						
	Target 8.2: Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high value added and labor-intensive sectors 8.2.1 Annual growth rate of real GDP per employed person				✓✓✓		✓✓
	Target 8.3: Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and	✓✓✓	✓✓✓✓				✓✓✓✓

Domain	SDG: Goal and Target / NDC	Project					
		OT- ONTAG	KNN	Travel Safety Zone	BCG*	Cotton Valley	Solar dried bananas
	growth of micro-, small- and medium-sized enterprises, including through access to financial services 8.3.1 Proportion of informal employment in total employment by sector and sex						
	8.1 Number of Tourism			✓			
	8.3 Employment from the Project 8.3.1 Share of informal employment in non-agriculture employment by sex.			✓			
	8.1 GDP growth			✓✓✓			
	8.1, 11.a.1 The number of trained enterprises. 11.a.1 Cities with more than 100,000 inhabitants that implement urban and regional development plans integrating population projections and resource needs.			✓✓✓✓✓			
	8.1, 6.2.1 More Sustainable tourism.			✓✓✓✓			
	8.1 Simple Travel Cost			✓✓✓✓✓			
	Target 8.9 By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products 8.9.1 Tourism direct GDP as a proportion of					✓✓	

Domain	SDG: Goal and Target / NDC	Project					
		OT- ONTAG	KNN	Travel Safety Zone	BCG*	Cotton Valley	Solar dried bananas
	total GDP and in growth rate						
	<p>Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation</p> <p>Target 9. b - Support domestic technology development, research, and innovation in developing countries, including by ensuring a conducive policy environment for, among other things, industrial diversification and value addition to commodities</p> <p>(Support domestic technology development, research, and innovation)</p>				✓✓✓✓		
SOCIAL	<p>Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture</p> <p>Target 2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists, and</p>				✓✓✓✓✓		✓

Domain	SDG: Goal and Target / NDC	Project					
		OT- ONTAG	KNN	Travel Safety Zone	BCG*	Cotton Valley	Solar dried bananas
	fishers, including through secure and equal access to land, other productive resources, and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment 2.3.2 Average income of small-scale food producers, by sex and indigenous status						
	Goal 3: Ensure healthy lives and promote well-being for all at all ages Target 3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water, and soil pollution and contamination				✓✓✓		
	Goal 4: Ensure inclusive and quality education for all and promote lifelong learning opportunities for all Target 4.7: Education for sustainable development and global citizenship 4.7.1 Training provides knowledge and skills that promote sustainable agriculture	✓✓✓	✓✓✓✓				

Domain	SDG: Goal and Target / NDC	Project					
		OT- ONTAG	KNN	Travel Safety Zone	BCG*	Cotton Valley	Solar dried bananas
	Goal 5: Achieve gender equality and empower all women and girls Target 5.5: Ensure women’s full and effective participation and equal opportunities for leadership at all levels of decision making in political, economic, and public life 5.5.2 the proportion of women in managerial positions (Increase proportion of woman in leading/ managerial positions in the project)	✓✓✓✓	✓✓✓			✓✓✓✓✓	✓✓✓✓
	Goal 6: Ensure availability and sustainable management of water and sanitation for all Target 6.2: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations. 6.2.1. Percentage of population using safely managed sanitation services			✓✓✓✓			
	Goal 11: Make cities and human					✓✓✓✓	

Domain	SDG: Goal and Target / NDC	Project					
		OT- ONTAG	KNN	Travel Safety Zone	BCG*	Cotton Valley	Solar dried bananas
	settlements inclusive, safe, resilient, and sustainable Target 11.4 Strengthen efforts to protect and safeguard the world's cultural and natural heritage 11.4.1 Total per capita expenditure on the preservation, protection, and conservation of all cultural and natural heritage, by the source of funding (public, private), type of heritage (cultural, natural), and level of government (national, regional, and local/municipal)						

Remarks:

* On the BCG project, this part of the assessment section is solely under the supervision of UNIDO and is not associated with UNDP.

✓ = having impacts at a particular level

6.1 Overall Evaluation Results

Each evaluated project has developed technical and policy guidance and recommendations on the project cycle process, impacts on SDGs and NDCs, and their sustainability, as shown in the project evaluation report in Annex II. Some potential policy guidance for project cycle development mainly emphasized general practices in the project cycle, including project design, planning, and implementation process, as well as the project impacts on SDGs and their sustainability. There are as follows:

1) **Project objectives were mainly laid out using a top-down approach** primarily by responsible government agencies, with some needs gathered from the local or rural officers who were not directly or minimally involved with the target groups.

2) **There is no clear evidence of a pre-analysis of the project's value for money.** Some selected projects lacked evidence of a value-for-money analysis before implementation due to a rush in approval and budget disbursement aimed at economic recovery.

3) **The project design is not primarily linked to the SDGs and NDCs.** It mainly focuses on economic recovery after the COVID-19 outbreak; the project's objectives might be partially linked to them.

4) **Moderate performance, mainly in the project cycle process.** Most selected projects demonstrated moderate performance in achieving planned deliverables; however, the aspects of "Impact on SDGs and NDCs" and "Sustainability" (the continuity of benefits and impacts) had lower scores than other aspects such as "Project Cycle Process" (Project Design, Planning, and Implementation).

5) **Projects have impacts on SDGs and NDCs to some extent.** Even though there are limitations on estimating the impacts on SDGs and NDCs in the project design and planning process, the objectives of selected projects could have impacts on the SDGs and NDCs to some extent. Some of the selected projects have impacts covering all sustainability domains, namely OT-ONTAG and KNN, both of which are agricultural-based projects; however, the rest do not address the environmental and social domains much, especially the travel safety zone project.

6) **Policy continuity and fulfilling legal and budgetary obligations for ongoing support are crucial.** Project sustainability, or the continuing of project benefits and impacts, is essential because most projects require a significant amount of time for their benefits to materialize. Therefore, policy continuity and fulfilling legal and budgetary obligations for ongoing support from government agencies should be seriously considered.

7) **The benefits of making the projects greener and more inclusive are somewhat apparent if SDGs and NDCs are incorporated into the design and planning process.** The financial or descriptive cost-benefit analysis has found that almost every project demonstrated that the benefits of making the projects greener and more inclusive would outweigh the costs based on the SDGs framework. Some projects may have more pronounced benefits in the environmental and social aspects than in the economic aspects; however, some have clear benefits in every aspect of sustainable development. Nevertheless, the projects would benefit if they incorporated SDGs and NDCs in the designing stage.

7. POLICY GUIDANCE, RECOMMENDATION, AND IMPLEMENTATION STRATEGY

7.1 General recommendations on the project cycle process, outputs, outcomes, impacts on SDGs, NDCs, and its sustainability

Each evaluated project has developed some technical and policy guidance and recommendations on the project cycle process, impacts on SDGs and NDCs, and its sustainability, as shown in the project evaluation report in Annex II. Some potential policy guidance for the project cycle development mainly emphasized general practices in the project cycle, including project design, planning, and implementation process, as well as the project impacts on SDGs and their sustainability. These are as follows:

Project Design

- 1) The project should have some procedures (e.g., need analysis, information gathering) to understand the target group's needs for setting the project's objectives.
- 2) The project rationale should address the target group's needs.
- 3) In the project design stage, related SDGs, NDCs, and BCG components should be considered to ensure the project rationale aligns with project-related SDGs, NDCs, BCG components, and national strategies and goals.
- 4) The expected outputs, outcomes, and impacts on the project-related SDGs, NDCs, and BCG components should be determined. Moreover, the project's key performance indicators (KPIs) to measure its outputs, outcomes, and impacts should be specific, measurable, attainable within the time limits, and relevant to the specified SDGs, NDCs, and BCG Components.
- 5) To define the project's target group, procedures should ensure that the selected target groups are appropriate and relevant to the project's objectives and activities.

- 6) To determine the project implementation areas, some criteria for selection should be used to ensure their appropriateness and relevance to the project's objectives and activities.

Project Planning and Analysis

- 7) There should be a project demand analysis to ensure the project outputs and outcomes are aligned with the demand and have the estimated benefits.
- 8) There should be some flexibility at the rural, local, and provincial levels to ensure that the project is relevant to the context of the area. One size does not fit all. Choosing the right project approach involves selecting which project management practices the project management team should perform based on the specific, high-level project characteristics gathered from the project implemented areas and other related environmental factors to plan and execute the project adequately.
- 9) The project activity and resource requirements planning should ensure the delivery of the expected outputs and outcomes as detailed in the technical analysis.
- 10) The project organization and team should be structured to clearly define the responsible project team members and drive the project to achieve its goals.
- 11) The value-for-money analysis should be conducted during planning to ensure the project is worth implementing.
- 12) A risk management system should be considered in the project design process, including identifying risk factors, estimating risk exposure, and preparing for risk management practices.

Project Implementation

- 13) There should be a monitoring system to measure interim progress and results, ensuring the project produces planned deliverables, reaches the target group, implements all activities as planned, and that all materials, information, and presentations are suitable for the target group. Additionally, the project's participants and other key stakeholders should be satisfied with all aspects of the project.
- 14) Some flexibility and empowerment should be allowed in decision-making at the level of local and rural officers so that when they confront specific problems at the project site, they can collaborate with other government units to solve legal and regulation-related issues.

Impacts on SDGs and NDC

- 15) Project officers, especially in managerial positions, should have substantial knowledge of SDGs, NDCs, and BCG models and effectively apply this knowledge in project design and planning. With the proper knowledge, technical details of the project and activities will be designed to have more impact on achieving national goals effectively.
- 16) SDGs, NDCs, BCG components, and other global development frameworks should be incorporated into the project's impacts.
- 17) Lessons learned, and the full description of successful case would enhance the possibility of extending the project to other sites and expanding the national-level impacts on SDGs, NDCs, and BCG model.

Sustainability

- 18) Continuation of the project is essential for its achievements, particularly in terms of sustainability, measured by both the number of successful cases and outcomes such as poverty elimination, rural development, and reduction of GHG emissions.
- 19) The capacity-building initiation of each project significantly contributes to developing more efficient skills and expands opportunities for practices that could lead to innovation and alternative means of rural development.
- 20) Collaboration networks among farmers, within and across communities, benefit farmers by facilitating information sharing and providing market access in the late stages of development.

7.2 Overall Policy Guidance and Recommendations

The overall project technical and policy recommendations to assist the government and policymakers in developing future SDG and NDC-aligned policies and recovery packages can be summarized as follows:

1) ***Project cycle process improvement***

- **SDGs, NDCs, and BCG components should be considered and incorporated into the project cycle process**, including determining the relevant outputs, outcomes, and impacts on SDGs, NDCs, and the BCG model. Project stakeholders at every level, from the responsible agency to the target group, should understand the SDGs, NDCs, and BCG model, be aware of the project design and planning process, and contribute to driving them toward the project objectives.

- **Enhancing stakeholders' participation and engagement in the project.** Stakeholder participation and engagement encompass attracting and involving individuals, groups, and organizations who may affect or be affected by the project. A management plan should be in place to identify the strategies and actions necessary to promote the productive involvement of stakeholders in project decision-making, planning, and execution.
- **Decentralization for a more geography-based approach.** Project planning and implementation should be decentralized to the local or provincial level. Since one design does not fit all, flexibility in planning and implementation (e.g., selection criteria for the target group, criteria for the area selection, etc.) should allow the project team in managerial and operational positions to adjust based on their area contexts and limitations. However, there should be a comprehensive framework for monitoring and evaluating.
- **Project design and planning throughout the value chain.** The project cycle process should be designed and planned to cover the value chain, delivering products to end-users to achieve the project's goals. Additionally, the project's outputs, outcomes, and impacts on SDGs and NDCs should be determined to benefit the target groups tangibly. For example, project activities from production to marketing management should be addressed to create income or job opportunities for the target group.
- **Value-for-money analysis should be conducted in planning to ensure the project is worth implementing.** Usually, value-for-money can be measured by comparing the benefits and costs of delivering outputs. Besides comprehensive budgeting and financial analysis, various qualitative tools also provide value for money. Public participation is expected for any government intervention where value for citizens is conceived and articulated. Stakeholder involvement at the concept level is crucial to fulfilling the social benefits. User surveys/feedback are examples of a powerful tool that helps the project implementer hear from the beneficiary. Moreover, the critical factors in obtaining the project value for money are directly related to project output/outcome determination. They should be specific, measurable, and tangibly benefit the target group.
- **Multi-year projects may be needed for some particular objectives.** Some large-scale projects are constructed over separate budgetary years, which cannot be separated into more minor, independent operational phases. To sustain the expected outcomes and impacts on SDGs and NDCs, some projects may need to be designed with continuous extension support to the existing target group. There should be procedures and practices to develop such multi-year projects in public programs/projects.

- **Collective actions via inter-ministerial collaboration in the project design and planning are required to ensure policy coherence and resource sharing.** Since adopting SDGs, Thai Government agencies have developed strategies, plans, and measures concerning the green economy through the NESDP, the BCG Model, and the Climate Change Master Plan (2015–2050). However, the practical measures for implementing these strategies and plans are still unclear, as are the specific mechanisms for coordination and achieving policy coherence (ILO and ASEAN 2021, cited in PAGE 2023a). Furthermore, the planning process is lack of integration to ensure policy coherence and resource sharing. This finding aligned with the ILO report (PAGE, 2023b), which stated that policy frameworks reaching local implementation levels lack standardized mechanisms across jurisdictions and ineffective systematic inter-agency coordination measures. It takes a long time for information and data to be shared between government line agencies, and sometimes they receive incorrect information from these agencies, or there is no cooperation or feedback. These issues were found in this study, especially in the case of extending the OT-ONTAG and KNN Projects as models to support smallholder farmers to be self-reliant, that is, be able to stand on their own two feet, and develop integrated farming via cooperatives or agricultural groups to market and deliver the products from farm to end users, leading to project sustainability. Integrated farming should be further developed into agroforestry. There should be collective actions by the government, coordinating the budgets among the relevant agencies within the Ministry and the Ministries, the private sector, and civil society. Mechanisms to create such collective actions are essential to ensure that the project design is policy coherent and has resource sharing to use the budget effectively.

2) Capacity building

- **Enhancing knowledge of SDGs, NDCs, and BCG model.** PAGE (2023a) has confirmed that Thailand has comprehensive policies but still lacks an integrated policy that includes all dimensions. Social conditions and cultural differences in each area are major challenges in implementing the SDGs. All sectors would need to understand the benefits of SDGs. Project officers, especially in managerial positions, should have a substantial understanding of SDGs, NDCs, and BCG model and apply this knowledge effectively in designing and planning the project. Moreover, stakeholders' participation and engagement in the project cycle processes are essential, and awareness can be enhanced via knowledge management mechanisms and capacity building. With the proper knowledge, the technical

details of the project and activities can be designed to have significant impacts on the achievement of national goals.

- **Capacity building related to technical skills is needed.** Projects should progress with continuing extension support, especially in capacity building related to green jobs and technical skills to achieve the SDGs. These issues were also discussed in the ILO report (PAGE, 2023a) on green job policy readiness in Thailand. These are critical success factors in implementing policies toward sustainable development. For example, OT-ONTAG and KNN could continually develop toward smart farming or more integrated agriculture. Project stakeholders should have enhanced technical skills in operating unfamiliar equipment, organizational and managerial skills, assessment skills on the project's economic aspects, and other relevant skills.

Furthermore, capacity building for non-agricultural projects, like Travel Safety Zone and Cotton Valley Creation, should focus on green and climate-responsive tourism. This capacity building follows the emerging trends of the global tourism industry since it links improvements in safety, greenness, and hygiene with the potential to create a higher value chain.

- **Knowledge and information related to the project should be systematically managed.** During project implementation, data and knowledge should be collected, and a mechanism developed to share that knowledge and information among project stakeholders and beneficiaries to facilitate mutual learning. For example, knowledge about intercropping management, circular farming, soil management, pest control, and other related agricultural-based projects, such as OT-ONTAG and KNN, should be gathered to assist the project beneficiaries in learning from other experiences.

3) Research and innovation towards SDGs, NDCs, and BCG model should be heightened.

Thailand's National Research Policy and Strategy, proposed by the National Research Council of Thailand (NRCT), are consistent with government policy, the 20-year National Strategy (2017-2036), the 13th National Economic and Social Development Plan, along with current economic, social and political changes inside and outside the country. It is envisaged that the concerned authorities will use the National Research Policy and Strategy for research guidelines and a framework for preparing and evaluating research proposals, as well as stimulating the private sector to invest in research to help develop the country

increasingly. Even though the National Research Strategies have mentioned several dimensions related to the SDGs, green recovery, and resilient society, the specific means of implementation, organization, and budgeting should be addressed to ensure that research and innovation can lead to transformative changes. Moreover, collaboration with international partners should be further pursued via research collaboration, technology demonstration, technology localization, and joint investment.

4) Transformative partnership

The achievement of the SDGs, particularly after the COVID-19 pandemic, must involve dramatic and transformative change and multi-stakeholder partnerships. Thailand has applied the Sufficiency Economy Philosophy (SEP), an approach that focuses on human empowerment, resilience, and environmental conservation, along with applying technology and local wisdom in addressing development challenges and promoting recovery efforts. This idea underlines the importance of a whole-of-society approach and the interconnectedness of the SDGs. Some key examples showcase the role of the private sector, civil society, academia, youth networks, and ordinary citizens in advancing SDGs at the national level. Some lessons should be learned that provide opportunities for project stakeholders to engage and discuss SDG implementation.

5) Financial sustainability

Limitations in Thailand's budgetary system, especially the budget from the Decree on Loan, mean it is not conducive to the continuity of the project. However, the project should not rely solely on the government budget; it should be able to survive financially in the long run. There should be some financial schemes to ensure project continuity and that the project's outcome and impacts on SDGs will be continuously delivered. For example, to drive integrated farming among the NTA farmers toward agroforestry – which supports achieving the nation's SDGs and NDCs – green lending with low interest could be an option for attracting change.

8. PUBLIC DISCOURSE ON THE OVERALL RESULTS, POLICY GUIDANCE, AND RECOMMENDATIONS.

The research team organized two workshops, locally and internationally, to share the evaluation results and policy implications and engage with public, private, and civil society stakeholders. The national stakeholder workshop was organized together with the UNDP public discourse in Loei province from 28 to 30 November 2022. A summary of the comments from the event is provided in Annex III.

Additionally, an international online workshop to share Thailand's best practices and lessons learned on green recovery efforts was organized on January 23, 2023, at the AMARI Watergate, Bangkok, and online via Zoom meeting. A summary of the comments from this event is given in Annex IV.

References

- Department for Communities and Local Government. (2009). *Multi-criteria analysis: A manual*. Communities and Local Government Publications. http://eprints.lse.ac.uk/12761/1/Multi-criteria_Analysis.pdf
- ILO and ASEAN (Association of Southeast Asian Nations). (2021). *Regional Study on Green Jobs Policy Readiness in ASEAN: Final Report*, June.
- Jahan, A., Edwards, K. L., & Bahraminasab, M. (2016). 4—Multi-criteria decision-making for materials selection. In A. Jahan, K. L. Edwards, & M. Bahraminasab (Eds.), *Multi-criteria Decision Analysis for Supporting the Selection of Engineering Materials in Product Design (Second Edition)* (pp. 63–80). Butterworth-Heinemann. <https://doi.org/10.1016/B978-0-08-100536-1.00004-7>
- NESDC. <https://thaime.nesdc.go.th>
- OECD. *Evaluation Criteria*. Available at <https://www.oecd.org/dac/evaluation/daccriteriaforevaluatingdevelopmentassistance.htm>
- PAGE 2023a, *Green Jobs Policy Readiness Assessment in Thailand*. Available at <https://www.un-page.org/countries/thailand/#knowledge-hub>.
- PAGE 2023b, *Green jobs and Just Transition policy readiness assessment in the agricultural sector: Case study in Mae Chaem District, Chiang Mai – Specific focus on the Khok Nong Na Model*. Available at <https://www.un-page.org/countries/thailand/#knowledge-hub>.
- UNEP, 2022. *UNEP Policy report: Thailand State of Green Recovery*.
- UNEP, 2023. *SCP-HAT Country Report Thailand*. SCP-HAT (Sustainable Consumption and Production Hotspots Analysis Tool) available at <http://scp-hat.lifecycleinitiative.org/module-1-country-profile/>
- Uzun Ozsahin, D., Denker, A., Kibarar, A. G., & Kaba, S. (2021). Chapter 4—Evaluation of stage IV brain cancer treatment techniques. In I. Ozsahin, D. U. Ozsahin, & B. Uzun (Eds.), *Applications of Multi-Criteria Decision-Making Theories in Healthcare and Biomedical Engineering* (pp. 59–69). Academic Press. <https://doi.org/10.1016/B978-0-12-824086-1.00004-9>

ANNEX I
NIDA Research Team Member

NIDA Team Members	Position	Responsibilities
Associate Prof. Dr. Nada Chunsom Coordinating Contact: Tel: +66 8184 58580 Email: nada@nida.ac.th ; nada5858@gmail.com	Program Director	<ul style="list-style-type: none"> - Direct overall project work plan - Develop the conceptual framework and project research methodology
Dr. Priyanut Piboolsravut Dharmapiya	Co-Program Director/Project Director/Senior Researcher	One Tambon One New Theory Agricultural Group Project
Dr. Atchara Yomsin	Researcher	One Tambon One New Theory Agricultural Group Project
Asst. Prof. Dr. Sunti Chaisrisawatsuk	Project Director	Kok Nong Na Model
Asst. Prof. Dr. Wisit Chaisrisawatsuk	Researcher	Kok Nong Na Model
Asst. Prof. Dr. Thasanee Stimanon	Project Director	2 Projects: <ul style="list-style-type: none"> - Development of Pilot Areas for the Travel Safety Zone - Upgrading the Economy in the Central-Western Economic Corridor using the BCG model
Asst. Prof. Dr. Monthien Stimanon	Researcher	2 Projects: <ul style="list-style-type: none"> - Development of Pilot Areas for the Travel Safety Zone - Upgrading the Economy in the Central-Western Economic Corridor using the BCG model
Assoc. Prof. Dr. Pakpong Pochanart	Project Director	2 Projects: <ul style="list-style-type: none"> - Cotton Valley Creation - Solar-powered Dried Bananas
Assoc. Prof. Dr. Chutarat Chompuhth	Researcher	2 Projects: <ul style="list-style-type: none"> - Cotton Valley Creation - Solar-powered Dried Bananas

ANNEX II
Project Evaluation Report

I. Project Evaluation Report

One Tambon One New Theory Agriculture Group (OT-ONTAG) Project

1. Project Background and Attributes

This project aimed to alleviate unemployment and lessen labor migration from the agricultural sector to other sectors while strengthening local communities to be a source of food production, choices of occupations, and building up warm families. Its main objectives were to promote learning and adopt the Sufficiency Economy Philosophy in developing learning areas of the New Theory of Agriculture for smallholder farmers. Its main activities included increasing the water storage area for agriculture and developing a water management system to restore the agricultural sector after COVID-19. The project played a crucial role in restoring the agricultural sector after the devastating impact of COVID-19. Ministry of Agriculture and Cooperatives was responsible for planning and implementing the project and disbursed the budget of 2,610.8 million baht, accounting for 73.7% of the allocated budget as of December 2021.

1.1 Responsible Agency:

Ministry of Agriculture and Cooperatives (MOAC)

1.2 Descriptions:

The epidemic situation of the coronavirus disease 2019 (COVID-19) had a severe impact both directly and indirectly on the Thai economy, particularly agriculture. Many workers decided to return to their homeland during the crisis when people were stockpiling food, which may lead to food shortages. The agricultural sector, the source of food production, became a means of survival for a group of repatriated laborers that would help them get through this crisis. Ministry of Agriculture and Cooperatives (MOAC), therefore, initiated the project One Tambon One New Theory Agriculture Group (OT-ONTAG) by adopting the Sufficiency Economy Philosophy (SEP) and the New Theory of Agriculture (NTA) as a guideline for implementation of the project to support farmers affected by the coronavirus disease 2019 epidemic situation.

The project aimed to support small rural farmholders in adopting sustainable farming practices. It sought to alleviate unemployment problems and lessen labor migration from the agricultural sector to other sectors. In addition, its purpose was to strengthen local communities to be a source of food production, choices of occupations, and building up a warm family. As a holistic development based on SEP, the project also intended to drive rural small farming towards sustainable agriculture system development. The passage could revive the rural economy in the short term and help strengthen the Thai economy in the long run, enabling farmers to support themselves and generate income for their families sufficiently and sustainably.

1.3 Project Status (as of 31 Dec. 2021)

Project completed	December 2021
Total approved budgets:	3,550.92 million baht
Total used budgets:	2,610.82 million baht (73.5%)

1.4 Project Objectives:

The OT-ONTAG had three main objectives as follow:

- 1) Promote learning and adopt the SEP by developing learning areas in the primary model of NTA.
- 2) Increase the water storage area for agriculture and develop an environmentally friendly water management system.
- 3) Restore the agricultural sector after the epidemic of coronavirus disease 2019 by focusing on farmers who have serious intentions to attend and expand the project while increasing income.

1.5 Target Group:

Smallholder farmers who had never joined the NTA project implemented by the MOAC were willing to be a demo farm once they succeeded.

Specific qualifications for farmers to join the project are as follows:

- Must be a farmer registered with the MOAC, general farmers or heirs of farmers or repatriated labor or volunteer farmers under the MOAC
- Aged between 18 - 60 years old and have Thai nationality
- Areas used for applying to join the project must be the same piece of land of no less than 3 rai with legal rights documents. The right of the farmland must belong to the applicant or their heirs (father and child, mother and child, legal husband and wife), and the applicant must have a residence in the area in which they applied to participate in the program
- The owner of the entitled document must agree to allow the MOAC to use the land to implement the project for not less than 7 years
- Applicants and farm areas used to apply to join the project must not be the same one as applied in the New Theory Agriculture Promotion Project (5 Coordinate Project) of the MOAC.

1.6 Project Goals:

- Develop the NTA plots in 4,009 Tambon (sub-district) nationwide
- A total of 32,000 farmers with land between 2.5-5 rai each joined the project.
- Employment of 16,000 local farmers/workers (1 worker per 2 plots)

1.7 Project Activities and Disbursements (as of Dec. 31, 2021)

Activities	Budget disbursement (mil. baht)	% of disbursement
1) Hiring workers to assist in implementing the project	1,061.70	40.67
2) Training expenses	37.47	1.44
3) Digging reservoirs in the NTA plot	1343.94	51.48
4) Support for soil nourishing factors	33.64	1.29
5) Support plantation factors	32.37	1.24

Activities	Budget disbursement (mil. baht)	% of disbursement
6) Support fisheries factors	35.59	1.36
7) Support livestock factors	34.57	1.32
8) Media & communications, monitoring & evaluation, management activities	31.55	12.08
Total budget disbursement	2,610.82	100

1.8 Geography:

Cover 70 provinces in all regions with breakdowns as follows:

Region	Provinces
North	16
Northeast	18
Central	22
South	14
Total	70

1.9 Outputs:

Based on the MOAC's internal monitoring and evaluation report:

27,117 plots of small farms participated in the project;

Developing **97,328 rai** of New Theory Agriculture area;

The project increased the **water storage area by 68.3205 million cubic meters.**

97.47% of farmers **applied their knowledge** of the SEP and the NTA in farming;

They created **15,102** local employees.

Outputs	Goals	Performances	unit	% Of Goals
1. Increase sustainable farming areas under the new theory agriculture	125,615	97,328	rai	77.5%
2. Increase the water storage area for farmers participating in the project	87.9987	68.3205	million m ³	77.6%
3. Capacity buildings on NTA farming and sustainable agriculture	32,000	27,117	farmer	84.7%
4. NTA farm model for demo and extension	32,000	27,117	plot	84.7%
5. Create jobs and generate income in the local area	16,000	13,529	worker	84.6%

Notes:

- 1) Farmers increased their water storage area by approximately 2,750 cubic meters per household, which is higher than the goal of at least 2,100 cubic meters.
- 2) On average, farmers participating in the project had changed the proportion of their land usage <water reservoir: rice fields: crops (fruit trees,

perennials, vegetables): living area and animal husbandry> from the proportion of 3:51:36:10 to **31:28:30:11**.

This happened due to increased water reservoir area while reducing rice and crop planting area, which was expected to increase food security, plantation biodiversity, and stable income.

1.10 Outcomes:

The OT-ONTAG project initially set three outcomes. Based on the Ministry's internal assessment, the outcome results of the project were as follows:

1) **Farmers have a career, income, and better quality of life.**

Farmers were rewarded with increased income from crop sales, 2,300.08 baht per household annually (up 33.62%), with a net income return of 7,156.55 baht/HH/ year. That is an increase of 1,793.78 baht/HH/ year, or 33.45%. This was caused by NTA smallholder farmers becoming more self-sufficient after joining the project, consuming more of their own produce, and making their own production factors.

2) **Promote environmentally friendly agricultural production**

The NTA farming was one type of integrated or multi-crop farming - crop-livestock-fish-agroforest - that relied on synergistic relationships between plant and animal system elements to reinforce the circular farming processes. Hence, the more NTA plots, the more sustainable agriculture production.

3) **Satisfaction of the farmer's occupation**

Farmers who joined the project and those workers employed as local laborers were overall satisfied with the project at 4.42 and 4.24 on a 5 scale, respectively, while the officers involved in the implementation of the project were satisfied at only 3.84.

2. Project Site Visits

2.1 Summary of site visits:

Our research collected data and information via questionnaires, in-depth interviews, and focus group interviews from 8 sites in 4 provinces (2 sites per province) with details of informants from each site as follows:

Project Site	Date/Time	List of Informants
1) Phra Nakhon Si Ayutthaya Province in the central region		
Bang Pa-in District, Wat Yom Subdistrict	Aug. 15 & 21, 2022	Project beneficiaries: 2 Plots: both 5 rai, one female, one male 1 Project worker: female/unemployed 16 Stakeholders: 15 local authorities responsible for the project: 1 community leader (F11/M5)

Project Site	Date/Time	List of Informants
2) Phang Nga province in the southern region		
Thai Mueang District, Bang Thong Subdistrict	Sep. 7 th -9 th 2022	Project beneficiaries: 2 Plots: both 3 rai, (2M) 1 Project worker: male / a retired officer of Phang Nga Provincial Agriculture and Cooperatives office 9 local authorities responsible for the project (F4/M5)
3) Nan Province in the northern region		
Chiang Khan District, Chiang Klang	Sep 20 th – 21 st 2022	Project beneficiaries: 2 Plots: both 3 rai farmers (1F/1M) 2 Project workers: 2 females / new graduates 14 local authorities responsible for the project (F9/M5)
4) Loei Province in the northeastern region		
Phu Kradung District, Huaysom Subdistrict,	Oct. 9 th -10 th 2022	Project beneficiaries: 2 Plots: both 3 rai, (1F/1M) 2 Project workers: 2 female farmers 9 local authorities responsible for the project (F5/M4)

2.2 Summary of 8 NTA Plot's Profile

Plot / NTA area	Total land owned (Rai)	Number of plants		Source of non-NTA income	Total Initial Investment (Baht) (Gov.: Farmer)
		Before NTA	After NTA		
Ayutthaya Province					
A1 5 Rai	6	1 Rice	20	Rice & Husband's salary	169,435.73 (57:43)
A2 5 Rai	9	1 Rice	17	Rice & Rental income	167,215.73 (58:42)
Phang Nga Province					
P1 3 Rai	20	1 Rubber	6	Palm & Rubber & Durian	121,009.16 (65:35)
P2 3 Rai	11	2 Rubber & Durian	11	Durian & Vegetables	169,227.26 (62:38)
Nan Province					
N1 3 Rai	9	2 Rice & Rubber	7	Rubber	134,999.22 (42:58)
N2 3 Rai	3	0	8	Online Business	136,799.77 (43:57)
Loei Province					
L1 3 Rai	8	6	18	Rice & Sugar cane	145,152.64 (40:60)
L2 3 Rai	35	2 Rice & Sugar cane	11	Sugar cane	79,355.16 (73:27)

Note: Farmers grew few short-term crops (e.g., vegetables and herbs) for household consumption in the NTA plots. Meanwhile, most farmers had more land than the areas used to participate in the NTA project, which incurred some income while starting and preparing the NTA plot. They also had income from non-NTA farming; for example, in Plot A1, the farmer had 6 rai of rice farms, but only 5 rai were used in participating in the NTA project. Therefore, the A1 plot farmer household had an income from rice farming of 1 rai, with additional income support from the husband's salary.

3. Multi-Criteria Decision Analysis (MCDA)

3.1 The set of evaluation criteria and scores for the OT-ONTAG project

The set of evaluation criteria emphasizes the project cycle process of project design, planning, and implementation as well as the output, outcome, and impacts on SCGs, NDCs, and BCG components to learn that the project has been well developed to achieve their goals and objectives and evaluate how it impacts on the sustainability and green recovery.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
3.1.1 Project Design					
1) Identifying project target group needs in setting objectives	<ul style="list-style-type: none"> - How was the project designed with its objectives? - Are there any forms of need analysis or supported information to set the project objectives? <p>* Identify the evidence showing the target groups' and stakeholders' involvement in project design and setting the objectives of the process.</p>	QL	<ul style="list-style-type: none"> 1- No evidence identifying procedure to define the project needs before setting the project objectives. 2- Mainly setting the objectives by using a top-down approach, slightly bottom-up to get the needs of the target group, 3- Mainly setting the objectives by using top-down, have some needs gathered from the target group 4- Mainly setting the objectives by a top-down approach with needs gathered from all target groups and stakeholders 	3	<ul style="list-style-type: none"> - The objectives and target groups were consistent with the NTA's concept of smallholders for integrated farming, which the ministry has operated since 2017. This project aimed to scale up the existing program. - After interviewing local officers, as the project formation was in a rush, the central agency determined the target group needs and set the objectives, with some information related to farmer needs submitted from local offices for formulating the project details. - As final decisions were made solely by the central agency, the target groups and qualifications were too rigid. They were applied similarly to all provinces that were different in geo-social conditions. - As a result, during the implementation of the project, the MOAC modified the target groups and

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	In the case of using the bottom-up approach, identify the procedure showing the bottom-up approach to set objectives.		5- Objectives are set by working together from top-down and bottom-up approaches.		qualifications to enable the operation of the project.
2) Project rationality	<ul style="list-style-type: none"> - What is the project's rationale? - Does the project rationale align with the SDGs and NDCs? 	QL	<ul style="list-style-type: none"> 1- No relation between the project's rationale and the SDGs and NDCs 2- Slightly related between the project's rationale and the SDGs and NDCs 3- Moderately related 4- Quite related 5- Strongly related 	4	The project's rationale was implicitly quite related to the SDGs and NDCs. It aimed primarily to support farmers affected by COVID-19, alleviate unemployment, and lessen the problem of labor migration from the agricultural sector (SDG1, SDG10). Its purpose was to strengthen local communities to be a source of food production (SDG2), choices of occupations (SDG8), build up a warm family, and drive rural small farming towards sustainable agriculture (SDG6, SDG15, NDCs).
3) Defining the target groups (criteria of selection)	<ul style="list-style-type: none"> - What are the criteria used to identify the project's target groups? - How well are the criteria developed? - Are the target groups appropriate in response to project objectives? 	QL	<ul style="list-style-type: none"> 1- No criteria determined, and not able to identify if the target group is appropriate 2- Some criteria are hardly defined to ensure that the target groups are appropriate 3- Fairly clear criteria and moderately ensure that the target groups are appropriate 	4	The criteria of the project's target groups were well developed and clearly identified as " <i>a farmer with small holding land area (2.5-5 rai), and willing to be a demo farm for extension.</i> " Specific qualifications for target groups were also developed, such as the need to be landowners or entitled to the land. These criteria and qualifications of target groups were appropriate in response to project objectives as they provide an incentive for farmers to work on small farms in a sustainable way.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	- Do the criteria ensure equity and inclusiveness?		4- Quite clear criteria and most target groups are appropriate. 5- Obvious criteria and all target groups are appropriate		However, the specific criteria were too rigid and could not be flexibly adjusted by localities; thus, they lacked inclusiveness. As a result, many farmers interested in joining the program—and who should have been target groups—were not qualified for the criteria.
4) Output/ Outcome/ Impact to SDGs and NDCs	- How do the outputs and outcomes of the project address the impacts on related SDGs and NDCs? - Identify the SDGs and NDCs related to the project (i.e., Green Recovery, Environmental, Inequality reduction, and Inclusiveness).	QL	1- No relation between the project's output/outcome and the impacts on SDGs, NDCs, and BCG component 2- Slightly related between the project's output/outcome and the impacts on SDGs, NDCs, and BCG component 3- Moderately related 4- Quite related 5- Strongly related	5	The outputs, outcomes, and impacts of the project implicitly addressed the impacts on related SDGs, NDCs, and BCGs as follows: <u>Environment:</u> increase resilient agricultural practices that helped maintain ecosystems (SDG2), lower level of water stress (SDG6), increase local forest area (SDG13), and restore degraded land and soil by integrated farming (SDG15) <u>Economics:</u> access to safe and nutritious food (SDG2), increase in household's annual income, and decent job creation (SDG 8) <u>Social:</u> provide knowledge and skills that promote sustainable agriculture (SDG4) <u>NDCs:</u> aligned with the national adaptation priorities by increasing water security and building climate resilience, household food security, and biodiversity in farming <u>BCG component:</u> promote circular economic activities via integrated farming

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
5) Defining the project risk management process	<ul style="list-style-type: none"> - Are there any concerns about risks related to the project during the project design process? - Are there any expected risks or obstacles that will make the project unsuccessful? - Is there any risk prevention or management integrated into project design? <p>*If any, identify the risks and obstacles to the project's achievement and the risk management process</p>	QL	<ul style="list-style-type: none"> 1- None of the risks and obstacles are determined, and management 2- Some risks or obstacles are determined but hardly defined and managed, or risks 3- Some risks or obstacles are fairly determined and managed 4- Some risks or obstacles are well-determined and managed 5- All risks and obstacles are well-defined and managed 	3	<p>Based on the documents, there was no evidence related to risk management in the project's design. However, based on interviews with officers involved, the project operating mechanism—the working committee at four levels—national, provincial, district, and subdistrict—had roles and authorities to modify the operation somewhat based on each area's circumstances. This mechanism can be considered risk management within the project. In fact, these working committees adjusted their work plans and approaches to accommodate the COVID-19 pandemic and heavy rains in some areas while implementing the project.</p>
3.1.2 Project Planning and Analysis					
6) The project's activity analysis	<ul style="list-style-type: none"> - What are the project activities? - Does the project activity cover the 	QL	<ul style="list-style-type: none"> 1- Not clearly defined project activities 2- Slightly clearly defined the project activities but did not 	4	<p>Project activities are clearly defined. They comprise:</p> <ul style="list-style-type: none"> ○ Recruitment and selection of farmers and project workers ○ Training farmers with 4 coursework

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	<p>deliverables of the project's expected output/outcome?</p> <p>- How did SDGs and NDCs develop into activities or criteria to select counterparts in each activity?</p>		<p>cover the expected outputs/outcome</p> <p>3- Somewhat clearly defined and cover the project output and outcome</p> <p>4- Clearly define and cover the project output/outcome related to the SDGs and NDCs.</p> <p>5- Very clearly defined and covered the project output/outcome and related to the SDGs and NDCs.</p>		<ul style="list-style-type: none"> ○ Digging reservoirs in the new agricultural theory plot ○ Support for soil nourishing factors, diversified plants, fishery factors, and livestock ○ Support marketing of produces ○ Continuous communication and advisory services ○ Monitoring and assessment <p>The above activities covered all expected output /outcomes and implicitly related to the SDGs and NDCs as stated in section 4) above.</p>
7) Involvement of target groups/ stakeholders in project planning and analysis.	<p>- Are the project's target group and stakeholders involved in the project planning and analysis?</p> <p>If any, identify the activity</p>	QL	<p>1- No involvement</p> <p>2- Slightly involved and not cover all the target groups and stakeholders</p> <p>3- Moderately involved and not cover all the target groups and stakeholders</p> <p>4- Most of the target groups and stakeholders are involved</p> <p>5- All of the target groups and stakeholders are involved</p>	2	<p>Interviewing with stakeholders at the local level revealed that few target groups and stakeholders were involved in project planning and analysis. Those involved were mainly government officials at the provincial level, while district officials or farmers were not involved.</p> <p>Stakeholders at the local level are involved more in implementing the project.</p>
8) The project's technical analysis	<p>- What are the project's resource requirements?</p>	QL	<p>1- No clearly define the project's resource requirements</p>	4	<p>In planning the project, the MOAC applied its many years of experience driving the NTA programs and</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	<ul style="list-style-type: none"> - Are the project's resources suitably related to the project's activities? - How were the project's resources obtained? 		<ul style="list-style-type: none"> 2- Slightly clearly defined but not related to the project activities 3- Moderately clearly defined and partly related to the project activities 4- Quite clearly defined and mostly related to the project activities 5- Well-defined and all related to the project activities 		<p>lessons learned to the technical analysis and resource requirements for each activity.</p> <p>The budgeting for each activity, such as reservoir digging, supporting plantations, etc., was well planned and coordinated among departments within the Ministry. However, not all local circumstances were incorporated in the planning, resulting in unsuitable production factors for some areas. Moreover, the timing of implementing project activities was not suitable for reality. It was in a rush and took too short a period.</p>
9) The project's organization & structure	<ul style="list-style-type: none"> - How was the project's team formed? - If any, define the procedure 	QL	<ul style="list-style-type: none"> 1- No clearly define the project's organization & structure 2- Slightly clearly defined but not related to the project activities 3- Moderately clearly defined and partly related to the project activities 4- Quite clearly defined and mostly related to the project activities 5- Well-defined and all related to the project activities 	5	<p>Based on experiences managing similar types of projects in the past, the MOAC had well-designed and defined the mechanism and team related to all project activities.</p> <p>In operating the project, the Office of Permanent Secretary of MOAC was the main unit – managing, coordinating, and communicating - with 5 supporting units directly responsible for project activities and disbursement. They were:</p> <ul style="list-style-type: none"> - The Department of Agricultural Extension is responsible for recruitment, selection, training, and marketing. - Department of Land Development – digging water reservoir - Department of Livestock Development – supporting livestock

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
					<ul style="list-style-type: none"> - Department of Fisheries – supporting fish - Office of Agricultural Economics – monitoring and assessment <p>Moreover, there were other 8 agencies within MOAC identified as supporting units.</p>
10) The project's value-for-money analysis	<p>Is there the project's value-for-money conducted?</p> <p>*Either qualitative or quantitative analysis is acceptable for evaluation.</p>	QL	<ul style="list-style-type: none"> 1- No analysis was conducted 2- Some analysis but hardly established result 3- Fairly conducted cost and benefit analysis, with positive results 4- Quite-well conducted cost and benefit analysis, with positive results in some dimensions 5- Well-conducted cost and benefit study, both economic and financial analysis with positive results in all dimensions (economic, social, and environmental) 	1	<p>There is no evidence that the project's value-for-money analysis was conducted prior to implementation due to the rush to seek approval and budget disbursement, which aimed for economic recovery.</p> <p>However, the post value-for-money analysis had been conducted internally.</p>
3.1.3 Project Implementation					
11) Produce the planned deliverables	- Does the project achieve all the planned deliverables?	QT	<ul style="list-style-type: none"> 1- None or Slight of the planned deliverables achieved (25% achievement or less) 	4	<p>After the project target group's modification, most of the planned deliverables, more than 75% on average) were achieved, and some activity indicators met the target as follows:</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
(percentage of achievement)			2- Some of the planned deliverables were achieved (more than 25% achievement) 3- Most of the planned deliverables were achieved (more than 50% achievement), and some activity indicators met the target 4- Most of the planned deliverables were achieved (More than 75% achievement), and some activity indicators met the target 5- All the planned deliverables were achieved, and all activity indicators met the target		<ul style="list-style-type: none"> - Recruitment and selection of farmers and part-time workers (achieved 84.74% = 27,117) - Training participating farmers with 4 coursework (81.75%) - Digging reservoirs in 26,950 new agricultural theory plots (99.38%) - Support for soil nourishing factors (96.99%) - Support diversified plantations (86.23%) - Support fishery factors (100%) - Support livestock (97.16%) - Support marketing of produces (100% with 24.53% can be demo plots) - Continuous communication and advisory services (100%) - Monitoring and assessment (100%)
12) Implement the plan	<ul style="list-style-type: none"> - Does the project reach the target group? - Do all project activities reach all parts of the target group? 	QT/ QL	1- Not meet the planned target group 2- Partly meet the planned target group, not achieve the target indicators	4	<p>If the project assessment had been based on the originating targets, the project would have met only 74.7%. However, the MOAC modified target groups and qualifications because not many farmers qualified for the original set targets. For example, the plotted target was modified from 3 rai for digging a 4000 m3 reservoir to 4 types of plot areas (2.5/3/4/5</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	<ul style="list-style-type: none"> - Are all project activities implemented as planned? 		<ul style="list-style-type: none"> 3- Mostly meet the planned target group and partly achieve the target indicators 4- Mostly meet the planned target group and achieve the target indicators 5- Well accomplished and reached all target indicators 		<p>rai) with the appropriate size of the reservoir to suit the reality in all regions. The project thus reached the target group of 84.7%.</p> <p>Regarding the project's workers, it was also modified from 8 persons per subdistrict to at least 1 person/subdistrict to suit the unemployment situation in all areas.</p> <p>With several modifications of targets and qualifications, the results of project implementation had achieved the planned target group and achieved target indicators as indicated in section 11) above. Our research surveys found that the project met the target group and achieved the modified target indicators at an average of 83.4%.</p>
13) Measure interim results attained	<ul style="list-style-type: none"> - Are participants and other key stakeholders satisfied with all aspects of the project? (Assess from the beneficiaries' perception) 	QT / QL	<ul style="list-style-type: none"> 1- No assessment of beneficiaries' satisfaction 2- Project beneficiaries are slightly satisfied 3- Project beneficiaries are moderately satisfied 4- Project beneficiaries are quite highly satisfied 5- Project beneficiaries are highly satisfied 	4	<p>An internal assessment of MOAC found that project beneficiaries were quite highly satisfied (over 80%) with the project as follows:</p> <ul style="list-style-type: none"> - Farmers were satisfied with project implementation 88.6% - Project workers were satisfied with project implementation 84.8% - Farmers were satisfied with various supporting factors 83.8% <p>The above assessment was in line with our research surveys, which found that local officers and community leaders were satisfied with 87.8% of overall project results, while beneficiaries (farmers</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
					and workers) were satisfied with the project's overall results at 88.4% and 84.8% on average.
14) Materials, information, and presentations are suitable for the target group	<ul style="list-style-type: none"> - How did the projects' materials and information present to the target group? - Are all materials, information, and presentations suitable for the target group? (Assess from the target groups' perception)	QL	1- No suitable and relevant at all 2- Hardly suitable and relevant 3- Fairly suitable and relevant 4- Quite suitable and relevant 5- Well-designed and communicated to the target group	4	<p>The projects' materials were well designed in the form of the project handbook and information presented to the farmers via explanation by officers in the field and following up frequently with project workers' site visits at least once a week. Moreover, various communication channels were set up under the project, such as short movies via TV programs, talk shows via radio programs, news scoops, press tours, and online (website, FB, YouTube, Twitter, line official, call center).</p> <p>The materials, information, and presentations were suitable for the target groups; the message was conveyed by local officers and project workers on the field. Moreover, the requisite knowledge was transferred via training coursework and study visits. Nevertheless, there were complaints regarding the coverage of all farmers during the PR and recruitment process. MOAC's internal assessment also found that 1.5% of beneficiaries did not receive information, and 18.25% of farmers did not receive training under the project. Moreover, miscommunication in some areas resulted in problems during implementation.</p>
15) The problems and obstacles in the project	<ul style="list-style-type: none"> - What are the problems and 	QL	1- None of the problems was solved	4	The main problems and obstacles in the project were as follows:

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
management process	<p>obstacles in project management?</p> <ul style="list-style-type: none"> - If any, define the problem and problem-solving process 		<p>2- Slight problems were solved, and most still are obstacles to the project's achievement</p> <p>3- Some problems are solved, and the project can be proceeded, but did not produce the expected outputs</p> <p>4- Most problems are solved, and the project can proceed and produce most of the expected outputs</p> <p>5- All problems are solved, and the project can proceed, produce the expected outputs, and monitor the process as a lesson learned for the future</p>		<ul style="list-style-type: none"> - The qualifications of the target group were too rigid that at the beginning, local officers could not find enough farmers or suitable workers who were qualified as targeted, leading to modifications of various qualifications. - Farmers' problems with designed reservoir shapes and managing excavating soil within the plot area gave rise to conflicts and dissatisfaction during the implementation process. - Due to the COVID-19 pandemic, many activities had to be delayed or modified. For example, farmers' training was changed from onsite to hybrid or online only. - Due to raining season in many areas, pond-digging activities were postponed and even canceled in some areas. Hence, supporting production factors had to be postponed accordingly. - Farmers had no or few skills in farm management, esp. integrated farm management with diversified products. This results in problems with growing or sustaining yields; e.g., chickens and ducks were gone, fish were not increasing due to water acid, plantations were not growing, etc. - Local officers had routine work, and this project was an extra workload with limited time and various specifications.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
					Overall, local officers coordinated well, working as a team while promptly seeking necessary advice from the Ministry when problems arose and trying to solve them as best they could. Hence, some problems were solved, and the project was able to proceed and deliver the expected outputs.
3.1.4 Overall Output Evaluation: measures the immediate effect of the program and is aligned with the project objectives.					
16) Project's output	<ul style="list-style-type: none"> - How well has the project achieved its objectives (and sub-objectives)? - Identify the achieved outputs 	QT/ QL	<ul style="list-style-type: none"> 1- None of the output achieved 2- The project was partly achieved (less than 40% achievement) 3- The project was partly achieved (41%-60% achievement) 4- The project was mostly achieved (61%-80% achievement) 5- All objectives are achieved (more than 80% achievement) 	4	<p>The project achieved its objectives and outputs; more than 75% on average, as follows:</p> <ul style="list-style-type: none"> 1) Promoted learning and adopted the SEP in the NTA <ul style="list-style-type: none"> - Farmers joined the project 84.7% (27,117) - NTA area increased 77.48% (97,328 rai) - Farmers applied obtained knowledge in life and farming activities 97.47% 2) Increased water storage area for agriculture and developed an environmentally friendly water management system. <ul style="list-style-type: none"> - Farm plots with reservoir increased 99.38% of all plots (26,950 plots from all 27,117 plots) - Reservoir area increased 77.64% (68.3205 from 87.9987 Mil.m3) 3) Restored the agricultural sector after COVID-19 while increasing farmers' income. <ul style="list-style-type: none"> - Farmers received supporting agriculture factors 95.10% (23,052/24,241 plots)

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
					<ul style="list-style-type: none"> - Hired workers in the agricultural sector 84.56% (13,529/16,000 person) - Farmer extended group activities to marketing 100% of planned (more than 1 group per province)
17) Achievement of project objectives	<ul style="list-style-type: none"> - Do all project objectives and indicators meet the targets? - Identify the indicators which meet the targets and do not meet the targets 	QT	<ol style="list-style-type: none"> 1- None or slight of the indicators meet the target (Less than 20% achievement) 2- 21%- 40% achievement 3- 41-60% achievement 4- 62-80% achievement 5- All indicators meet the targets (more than 80% achievement) 	4	<p>Our surveys found each objective met the target 82% overall, with details as follows:</p> <ol style="list-style-type: none"> 1) Promoted learning and adopted the SEP in NTA <ul style="list-style-type: none"> - NTA area increased 82% - Farmers applied obtained knowledge in life and farming activities 97.4% 2) Increased the water storage area by 96% 3) Restored the agricultural sector after the COVID-19 while increasing farmers' income <ul style="list-style-type: none"> - income increased 77% - employments increased 78% - Farm plots that could be demo plots 76%
3.1.5 Outcome Evaluation: concerned with the program's long-term effects and is generally used to measure the program goal. Consequently, outcome evaluation measures how well the program goal has been achieved.					
18) Measure the achievement of the overall goals	<ul style="list-style-type: none"> - Have the overall program goals been achieved? - Identify the goals which meet the targets and do not meet the targets. 	QT	<ol style="list-style-type: none"> 1. None or slight of the goals achieved (less than 20% achievement) 2. 21%-40% achievement 3. 41%- 60% achievement 4. 61%-80% achievement 5. All goals achieved (more than 80% achievement) 	3	<p>The overall program outcomes as stated in the project document achieved more than 80%, while from our survey stakeholders viewed outcomes had been achieved 88% as follows:</p> <ul style="list-style-type: none"> - Farmers had better quality of life (82%) - Promoted environmentally friendly agriculture (87%) - Increased pride in farming profession (87%)

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	- Identify visible results or changes arising from the project				However, several expected outcomes had not generated results nor observed. They were farm products value adding; more young farmers returned to hometown; SME agri-business development; continuing human resource development in agricultural sector.
3.1.6 Specific Indicators (Project-based indicators) The impact of the project on achieving each Sustainable Development Goal related to the project					
Environmental impacts					
19.1) Increase resilient agricultural practices that help maintain ecosystems of integrated sustainable farmland area SDG 2.4.1	- Number of NTA farming area increased under the project (in rai) - Use of chemical substances such as chemical fertilizer or pesticide (before/after)	QT	1. None of the impact on the goals/indicators 2. Slight impacts 3. Moderate impacts 4. High impacts 5. Very high impacts	4	- The ONTAG project increased integrated sustainable farmland area 3-5 rai for each plot, altogether 27,117 plots nationwide. In the long-run, NTA project would increase forest area through local agroforestry farmland. - All NTA farmers used less or no chemicals in their NTA plot, hence reducing chemicals in agriculture accounted for 97,328 rai nationwide.
19.2) Lower level of water stress SDG 6.4.2, NDCs	- Number of water storage areas that increased under the project (in mil. m3) - Sufficiency of water usage for the	QT	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	4	Regarding SDGs and NDCs concerns, the NTA farm method promotes and strengthens integrated water resources management practices, realizing water security and effective water resource management to mitigate floods and droughts.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	whole year (consumption/ agriculture) scale 1-10 / before - after				<p>The ONTAG project increased the water storage area by 2,100 – 3,500 m³ per plot, aggregating 68.3205 million m³ nationwide.</p> <p>From our surveys, framers gave scores in water sufficiency for consumption and agriculture increased from 8 to 9 and from 0 to 10, respectively. Hence, farmers were overall satisfied with the project because they had sufficient water for agriculture all year round.</p> <p>However, after interviewing officers involved, we found that some ponds still had problems with soil conditions—they were unable to store water or had an acidity condition.</p>
19.3) Increase local forest/trees area SDG 13.2.2, NDCs	- Numbers of planted trees during year 2020 / estimation of Co2 absorption for next 10 years	QT	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	4	<ul style="list-style-type: none"> - Each NTA plot under the project grew at least 50-80 perennial trees. On average, one mature perennial could absorb 9-15 kg of Co2 per year. Therefore, one NTA plot could absorb at least 450-1,200 kg of Co2 per year over the next 10 years. - Assuming the success rate of 27,117 NTA plots is 50%, based on our survey, 13,558 NTA plots would absorb at least 6,100 – 16,270 tons of Co2 by 2030.
19.4) Restore degraded land and soil by integrated	- Diversification of types of trees/plants that farmers grow, comparing	QT/ QL	1- None of the impact on the goals /indicators 2- Slight impacts 3- Moderate impacts	4	The NTA project is one type of integrated farming that fosters biodiversity and restores the abundance of ecosystem. Before participating NTA project, farmers grew monocrop such as rice, sugar cane,

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
farming SDG 15.3.1, NDCs	before/after participating in the project		4- High impacts 5- Very high impacts		cassava, rubber, and longan. However, after joining the project, they grew varieties of plants based on the area's localities. On average, farmers grew 2 types of plants before joining the project and increased to 12 types of plants after one year of joining the project. Examples of growing trees and vegetables are as follows: <ul style="list-style-type: none"> • Fruit trees: Banana, Coconut, Guava, Durian, Avocado, Longan, Mango, Rambutan, Pomelo, Watermelon, etc. • Vegetables: Lemon, Chili, Lemongrass, Ginger Eggplant, Basil, etc.
Economic impacts					
19.5) Improve access to safe and nutritious food SDG 2.1.1	Household food consumption (scale 1-10 / before–after) <ul style="list-style-type: none"> - varieties of food consumption - satisfaction - Satisfaction from self-reliance farming technique 	QT	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	4	Related to SDGs and NDCs, the NTA farming method supported food security by promoting self-reliance and biodiversity at the household and community levels. From interviews with farmers, we found the following evidence (1-10 scale): <ul style="list-style-type: none"> - After participating in the NTA project, farmers' food diversity scores improved from 2 to 4. - Satisfaction with food diversity improved from 2 to 4. - Farmers' satisfaction with the self-reliance farming technique improved from 7 to 8. Moreover, self-reliance had been perceived as decent and good, though household self-sufficiency was not

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
					preferable among Thai farmers. Most farmers bought food from the local market because their vegetables and trees were not growing sufficiently.
19.6) Increase household's annual income SDG 8.1.1	Income generation in the local area from local employment Investment effectiveness of the project (NPV, IRR, PB)	QT	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	4	<ul style="list-style-type: none"> - From the farm-level financial analysis, the numbers show that the NTA project is worth the investment. - Farming takes at least 2 years to generate positive net income from agricultural products. As a result, farmers' income declined in the first two years. However, farmer household expenditures also declined. Hence, in the long run, farmers' net incomes would increase. - When analyzing the 8 sample plots' investment value considering the project life of 10 years and cost of capital at the rate of 6% with the investment cost of 100,000 – 170,000 baht. - The results showed that the Net Present Value (NPV) was positive for all 8 plots (with values between 1160,000 – 887,000 baht), the Internal Rate of Return (IRR) was in the range of 23 - 32%, and the Payback period of less than 5 years.
19.7) Create decent jobs SDG 8.3.1	<ul style="list-style-type: none"> - Number of jobs created - Are beneficiaries unemployed before? 	QT	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	3	<ul style="list-style-type: none"> - 27,117 farmers participated in the NTA project and could make better use of their own farmland due to the increase in water storage area and improved soil conditions. In the long run, these water reservoirs would lead to higher yields and economic security. Nevertheless, our survey

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	<ul style="list-style-type: none"> - Are beneficiaries migrating back due to covid 19? - If yes, do they plan to return to work in the city or stay on the farm post-COVID? 				<p>found that 50% of farmers joining the project continued with the integrated farming, i.e., half dropped out and discontinued utilizing the pond under the project.</p> <ul style="list-style-type: none"> - The project also employed 13,529 part-time workers, who were newly graduated and unemployed prior to joining the project. Although they hoped for a long-term employment, but it is only one year contract.
Social impacts					
19.8) Training provides knowledge and skills that promote sustainable agriculture SDG 4.7.1	<ul style="list-style-type: none"> - Number of farmers who received NTA related training under the project - Training course syllabus (length/contents) - Usefulness / how to improve course syllabus) 	QT/ QL	<ul style="list-style-type: none"> 1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts 	3	<p>All farmers had received training in at least four courses.</p> <ul style="list-style-type: none"> o Sufficiency Economy Philosophy and New Theory Agriculture (12-hour training course) o Planting planning (6-hour training course) o Online marketing (6-hour training course) o 1-day field trip to the integrated farm learning center. - Most farmers joining the project need ongoing training in integrated farming management skills. They also need mentors and sustainable farm networks to support the continuity of productive farming.
19.9) Increase proportion of women in leading/	<ul style="list-style-type: none"> - Numbers/proportion of women farmer 	QT / QL	<ul style="list-style-type: none"> 1- None of the impact on the goals/indicators 2- Slight impacts 	4	<p>The roles of women in the project were clearly observed. Although the project did not particularly intend to increase women's roles, this did not prevent</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
managerial positions in the project SDG 5.5.2	<ul style="list-style-type: none"> - participating in the project woman - Roles of women in implementing the project - example of an outstanding case 		<ul style="list-style-type: none"> 3- Moderate impacts 4- High impacts 5- Very high impacts 		<p>women from being inclusive in joining or managing the project.</p> <ul style="list-style-type: none"> - From data collection of farmers joining the project, 49.52% were women landowners. They inherited the land from their elderly parents and would like to revitalize the family farmland. Women farmers tended to work in detail and grow diversified plants that were useful for household consumption while keeping household accounting. These activities helped sustain the NTA farm and household economy. - Among all project part-time workers, 69.12% were female workers. - Moreover, among officers responsible for the project implementation at the local level and joining the focus group discussion, 60% of them were female.
3.1.7 Overall Impact Evaluation:					
20) Measure the project's overall impacts on the progress of SDGs	<ul style="list-style-type: none"> - How well does the output/outcome of the project achieve the progress of the SDGs, NDCs, and BCG components? 	QL	<ul style="list-style-type: none"> 1- None of the output/outcomes achieving progress on the SDGs 2- Slightly achieving 3- Moderately achieving 4- Much achieving 5- A great deal in achieving 	4	<p>An impact assessment in section 3.1.6 above linked the output/outcomes of the project with the SDGs' relevant targets and indicators. From the results, the project's overall impacts, if they persist, would have a high potential to assist the progress of SDGs for the country.</p> <p>Nevertheless, our surveys found that continuity of extension support is critical to sustainability; farm activities need some period of continuity to produce</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
					the results and yields that would create the desired impacts.
21) Measure the project's overall impacts on the progress of NDCs	- How well does the output/outcome of the project achieve the progress of the SDGs, NDCs, and BCG components?	QL	1- None of the output/outcomes achieving progress on the NDCs 2- Slightly achieving 3- Moderately achieving 4- Much achieving 5- A great deal in achieving	4	From 19.3) above, perennial trees grown in each NTA plot could absorb at least 450-1,200 kg of CO ₂ per year over the next 10 years. With a success rate of around 50%, the project's overall outcomes would, at most, contribute to absorbing 16,270 tons of CO ₂ by 2030. Moreover, the project's overall results contributed to water resources management, agriculture, and food security. More than 20,000 farmers joining the project developed climate resilience, which could expand to the demo plots.
3.1.8 Sustainability: Continuity of the benefits and impacts. The extent to which the net benefits of the intervention continue or are likely to continue.					
22) The project's net benefits of the intervention continue or are likely to continue	- Will the outputs last	QL	1- Absolutely not. 2- Maybe not 3- Not sure/unclear 4- Very likely 5- Definitely possible	3	Farm activities need continuous farm attendance, support factors, and capacity building in integrated farm management for new farmers joining the project. The project's period of one year could not yet yield high results for agriculture. Soil improvement, fishery, plants, and livestock all needed continuity of support for at least 1-2 years for farmers to be self-reliant and reap the profits. Our surveys showed that local officers planned to support farmers who joined the project if they were still working on the NTA. However, there were no legal obligations or clear

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
					policies for this continued support from the central agency.
23) The project's flow of net benefits or the likelihood of net benefits continuing to deliver the outcomes and impacts over the medium and long term.	- Will the outcomes have the potential to deliver in the long term	QL	1- Absolutely not. 2- Maybe not 3- Not sure/unclear 4- Very likely 5- Definitely possible	3	To achieve the expected outcomes as designed in the project, the continuity of project activities, such as supporting knowledge and production factors, was essential. Although there was 5 years commitment between farmers and the Ministry, written in the project document, there was no evidence of continuity of the project in terms of budgeting within the Ministry, except some local offices continued their support for farmers under the project with their regular budget.
3.1.9 Cost-Benefits Analysis on making project greener and more inclusive					
24) Estimate the benefit and cost to make the project greener or more inclusive	- Does the benefit outweigh the cost of making the project greener and more inclusive?	QL	1- Absolutely not. 2- Maybe not 3- Not sure / unclear 4- Very likely 5- Definitely possible	4	Based on our analysis above, the project's benefit outweighs the cost. An internal assessment of the project by the MOAC also confirmed the outweigh as follows: Economic impact - Increased farm's net return by 33.6%, compared with before joining the project. - Value adding in the economy: with the multiplier analysis, using the I/O table, the project created an economic impact 2.47 times its disbursement. Social Impact

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
					<ul style="list-style-type: none"> - Promoted group integration among farmers: 12% of all farmers joining the project form or join groups or networks. <p>Environmental impact</p> <ul style="list-style-type: none"> - Chemical use in farming was reduced by 50.7%, while some chemicals were used in existing cash crop activities. - Farming integrated activities for 61.3%, while 38.6% did not have much diversified products due to the short period since the NTA started. <p>We concluded that, with some revisions to planning and implementation, the project could be expanded to support greener recovery and be more inclusive.</p>

Remark:

* QT = Quantitative Indicators and QL = Qualitative Indicators.

3.2 MCDA's Results and Discussion

3.2.1 MCDA's Results – OT-ONTAG Project

Table I(a) MCDA's Results—OT-ONTAG project

Evaluation Criteria		Weight	Total Score	OT-ONTAG
Relevance & Coherence	Project Design/Planning	20%	100	70.00
Efficiency	Project Implementation	20%	100	80.00
Effectiveness	Overall Output / Outcome	20%	100	70.00
Impact	Impacts on SDGs and NDC	20%	100	77.50
Sustainability	Continuity of the benefits and impacts	20%	100	60.00
OVERALL EVALUATION		100%	500	357.50

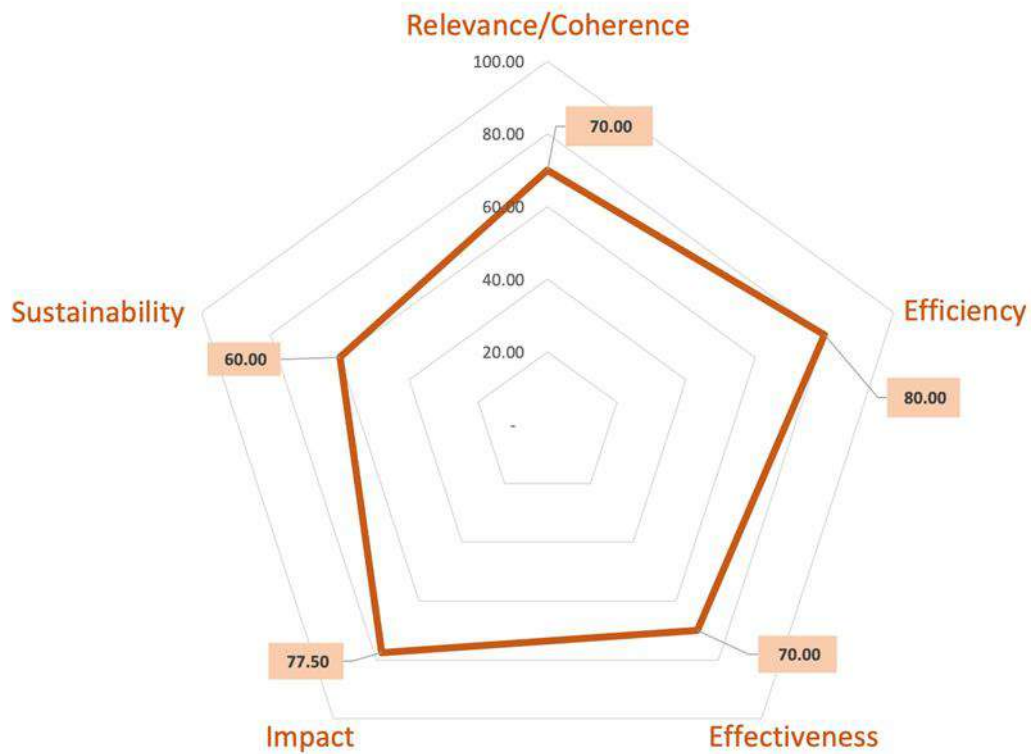


Figure I(a) Project Evaluation

3.2.2 Discussion

1) Relevance & Coherence

The ONTAG project design was strongly relevant to SDGs and NDCs, with its expected outputs, outcomes, and impacts in line with several SDGs and BCG strategies. Regarding the NDCs, the project contributed to national adaptation priorities by helping increase water security and building climate resilience, household food security, and biodiversity in farming. Although the project's objectives were laid out top-down by the Ministry, some needs were gathered from local officers and the local target groups. The criteria and qualifications of target groups were appropriate in response to project objectives, aiming to support smallholder farmers in transforming towards sustainable agriculture.

Project planning and analysis were clearly defined and coherent with the project outputs and outcomes, related to the SDGs and NDCs. The project's activities covered all project deliverables, with a clearly defined technical analysis related to those activities. Target groups or stakeholders had minimal involvement in project planning and analysis. Thus, the timing of implementing project activities was not suitable for reality. The project's organization and structure were well-defined, related to the activities, and worked as an internal risk management mechanism. There was no evidence of the project's value-for-money or feasibility analysis prior to implementation due to a rush in approval and budget disbursement aiming for economic recovery. Nevertheless, the Ministry's long-term experiences in implementing similar schemes helped design and plan the project.

2) Efficiency

The ONTAG project was implemented with **high efficiency, but only after modifications** of target groups and their qualifications during implementations. Based on surveys, the planned deliverables were achieved by more than 75%, with activity indicators meeting the target at 83.4% on average. Local officers and community leaders were satisfied with 87.8% of overall project results, while beneficiaries (farmers and workers) were satisfied with 88.4% and 84.8%, respectively. In terms of communication, the project's handbook and information were presented to farmers via explanation by officers in the field and followed up with frequent visits by project workers, along with various communication channels. Yet, some target groups complained about not receiving information, while miscommunication resulted in problems during implementation. Nevertheless, most problems were solved hands-on, and the project proceeded and produced the expected deliverables.

3) Effectiveness

The ONTAG project achieved its objectives, outputs, and outcomes with great **effectiveness**. With the objectives to promote learning and adopt the SEP in the NTA farming, increase water storage area for agriculture, and restore the agricultural sector

after COVID-19 while increasing farmers' income, our surveys found that the objectives met the overall target at 82%. Some farmers joined the project and applied obtained knowledge in life and farming activities more than 80% of the set goals. The project increased water storage for agriculture by 77.64% while supporting farmers with agricultural factors by 95.10% and hiring workers in the agricultural sector by 84.56% of the set targets. The overall program outcomes were achieved by more than 80%: farmers had a better quality of life (82%), promoted environmentally friendly agriculture (87%), and increased pride in the farming profession (87%). However, several expected outcomes have not yet yielded results, nor were they observed, such as farm product value-adding, more young farmers returning to their hometowns, SME agri-business development, and continuing human resource development in the agricultural sector.

4) Impact on (SDGs & NDCs)

Environmental impacts

The ONTAG project increased **resilient agricultural practices** of integrated sustainable farmland areas that help maintain ecosystems, accounting for 97,328 rai nationwide (**SDG 2.4.1**). The project also lowered the level of **water stress** by promoting integrated water resources management practices 68.3205 million m³ nationwide, resulting in water security at the household level of 27,117 farms (**SDG 6.4.2**). The project increased **local forest area** that could absorb at least 6,100 – 16,270 tons of Co2 by 2030 (**SDG 13.2.2**) while restoring degraded land and soil by fostering biodiversity and restoring the abundance of the ecosystem (**SDG 15.3.1**). Moreover, due to the project's contribution to water resources management, agriculture, and the food security sector, more than 20,000 farmers joining the project are more climate resilient, with a potential to expand with the demo plots (**NDC**).

Economic impacts

NTA farming has improved access to **safe and nutritious food** by supporting food security and promoting food diversity at the household and community levels (**SDG 2.1.1**). However, most farmers still buy food from the local market because their vegetables and trees are not yet growing enough. Farmers can expect **net income** to increase in the long run with at least 2 years to generate positive net income from agricultural products (**SDG 8.1.1**). The NPV is positive with values between 300,000 – 550,000 baht, the IRR is 25 - 40%, and the Payback period is less than 5 years. The project also **created decent jobs** by employing 13,529 part-time workers who were newly graduated and unemployed prior to joining the project (**SDG 8.2.1**).

Social impacts

The ONTAG project provided training with knowledge and skills that promote sustainable agriculture (**SDG 4.4.1**). However, ongoing training in integrated farming management skills, mentors, and sustainable farm networks are crucial in maintaining the continuity of productive, integrated farming. In addition, the inclusiveness of women in the project was clearly observed (**SDG 5.5.2**). In Thailand, daughters inherit the land from their elderly parents and intend to revitalize the family farmland. Women farmers tend to

work in detail and grow diversified plants useful for household consumption while actively managing household accounting. These activities help sustain the NTA farm and household economy.

5) Sustainability

To achieve the **impacts** on the SDGs and NDCs, the **continuity of project activities, such as supporting knowledge and production factors as part of extension supports, is necessary**. The project's one-year period could not yet yield satisfactory results for agriculture. We found that local officers in some provinces intended to continue their support for those farmers if they were still working on the NTA. However, those extension supports are uncertain as there have been no legal obligations or clear policies for these continued supports from the central agency.

In summary, the project's overall impacts, if they persist, would have a high potential to assist the progress of several SDGs and NDCs for the country. Nevertheless, from our surveys, we found an issue of continuity critical, as farm activities need some period of continuity to ripen the results and create impacts as desired.

4. Project's Value for Money: Project Financial Analysis

4.1 Methodology

We collected data from 8 farmers - 2 from one province - in 4 provinces in different regions through in-depth interviews using semi-structured questionnaires that allowed farmers to provide information and voice their opinions fully. The critical information collected from farmers consisted of quantitative and qualitative data, such as the amount of investment, number and type of plants, utilization of the area, occupation, source of income, estimated income and expenses, assets, and liabilities before and after participating in the NTA project. The data were used to prepare a 10-year profit and loss statement projection based on assumptions from interviews with farmers with long experiences in New Theory Farming. The Incremental Net Income (Net Income after joining the NTA project minus Net Income before joining the NTA project) was used to assess project worthiness. We used net present value (NPV), internal rate of return (IRR), and payback period to analyze the farm-level financial situation.

4.2 Assumptions for yield estimation

- 1) **Assumptions** for farm-level financial analysis for the OT-ONTAG project
 - Short-term crops (such as vegetables and herbs) are grown for household consumption.
 - Medium-term crops (such as banana, guava, papaya, dragon fruit, pineapple, etc.) can generate income from the first year of planting. Since farmers have little experience with NTA farming, the early years' projections for yields and income are relatively small. Starting from 30-50% in the first years and increasing in the subsequent years, depending on the type of plants.
 - Most perennial crops (such as durian, avocado, longan, rambutan, mango, mangosteen, coconut, etc.) bear fruit in the third year, while others in the

fourth or fifth year. Since farmers have little experience with NTA farming, the early years' projections for yields and income are relatively small. Starting from 30-50% of the first crop and increasing in the subsequent years, depending on the type of plant.

- Costs consist of fertilizer, wage of harvest, and other variable costs.
- Most farmers raise fish in the pond for household consumption. In financial calculations, the survival rate of 50% was used as an assumption, and for income from fish farming, we assumed that farmers could sell 50%—80% of their surviving fish each year.
- Net cashflow used to calculate NPV, IRR, and Payback period was the incremental net income (Net income after joining the NTA project minus Net income before joining the NTA project)

2) Other information used in financial analysis calculation

- Most farmers have more land than the NTA participating areas, so they had income from non-NTA farming. For example, in Plot A1, the farmer has 6 rai of rice farms, but only 5 rai participated in the NTA project, so farmers had income from rice farming of 1 rai. A1 farmer also had income support from her husband.
- Costs included fertilizer, wage for harvesting, and other variable cost.
- Based on interviews with farmers who had long experience in NTA farming, we found that farmers usually need continuous extension support for at least three years in terms of seeds, fish feed, fertilizer, and, most importantly, integrated farming knowledge training to continue and succeed in NTA farming.

3) Assumptions related to yield estimation

Assumptions derived from interviews with experienced farmers in similar geological conditions are as follows:

Type of plant	First yield	Yield per tree	Number of harvest times per year	Unit price (Baht)
Short-term crops				
Thai eggplant	3 months	2 kg.	3	24
Chili	3 months	0.5 kg.	6	60
Kaffir lime	10 months	4 kg.	1	40
Medium-term crops				
Banana	1st year	8 bunces	1	60
Guava	1st year	6 kg.	2	25
Papaya	1st year	30 papayas	10	21
Red dragon fruit	1st year	14 kg.	1	15
Yellow dragon fruit	1st year	14 kg.	1	20
Sugar cane	1st year	3 kg,	1	10

Jujube	1st year	50 kg.	1	25
Pineapple	2nd year	1 pineapple	1	10
Perennial crops				
Custard apple	3rd year	5 kg.	2	30
Coconut	3rd year	120 coconuts	2	12
Rambutan	3rd year	40 kg	1	20
Mangosteen	3rd year	55 kg.	1	20
Kratom	3rd year	4 kg.	12	150
Lychee	3rd year	35 kg.	1	60
Durian	4th year	29 kg.	1	70
Longan	4th year	50 kg.	1	40
Mango	4th year	22 kg.	1	30
Sweet Tamarind	5th year	30 kg.	1	80
Long kong	5th year	5 kg.	1	50
Avocado	5th year	12 kg.	1	50
Acadia mangium	8th year	1 tree	-	143
Champa thong	10th year	1 tree	-	10,000
Yangna	10th year	1 tree	-	1,550
Mahogany	10th year	1 tree	-	4,170
Takian thong	10th year	1 tree	-	10,000
Neem	10th year	1 tree	-	2,000
Bamboo	12th year	1 clump	-	2,990
Krathinthep narong	15th year	1 tree	-	4,049

Type of Fish	Survival rate	Number of fish per kilogram	Unit price (Baht/kg.)
Tilapia	50%	1.5	30
Catfish	50%	3	35
Red Tilapia	50%	2	75
Carp	50%	6	40
Seven stripped carp	50%	3	70
Prawn	40%	25-30	270
Frog	60%	5	90

4.3 Results (NPV/ IRR/ Payback Period)

The financial analysis of 8 plots, considering the **project life of 10 years** and **6% cost of capital**, found that joining the NTA project is **worth the investment**. At the investment cost of 80,000 – 170,000 baht for each plot, the results showed that:

- **Net Present Value (NPV)** is positive for all 8 plots (with the values between 116,000 – 887,000 baht),
- **Internal Rate of Return (IRR)** is in the range of 23 – 32% and
- **Payback period** of 4 - 5 years.

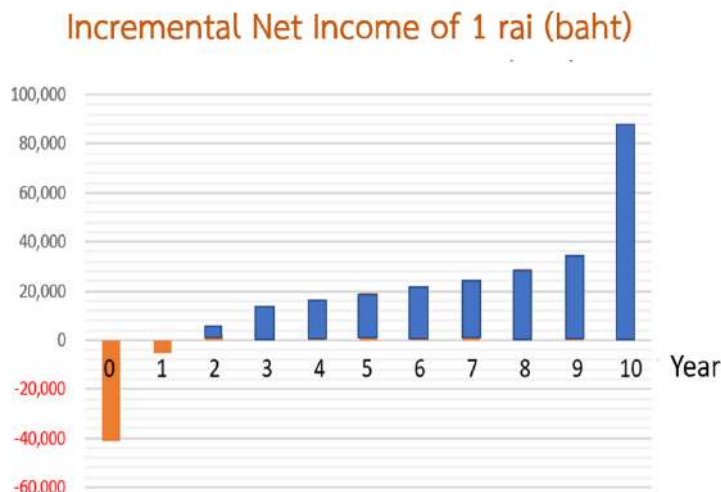
Based on calculation of an investment in 1 rai, and 97,328 rai under the OT-ONTAG project countrywide, the NPV, IRR, and Payback Periods of this project are shown below.

Year / Plot	Net CF A1	Net CF A2	Net CF P1	Net CF P2	Net CF N1	Net CF N2	Net CF L1	Net CF L2	Weighted average (Public + Farmer)	
Area (Rai)	5	5	3	3	3	3	3	3	1	97,328
0	-169,435.73	-167,215.73	-121,009.16	-169,227.26	-134,999.22	-136,799.77	-145,152.16	-79,355.16	-41,188.90	-4,008,833,253.77
1	-58,444.71	-19,084.30	-5,953.29	-59,257.24	-4,417.25	-6,814.34	-3,900.16	-2,957.38	-5,409.04	-526,451,497.26
2	-34,303.63	-4,812.99	17,870.77	-9,257.24	15,541.62	20,956.31	37,636.06	-60.76	2,467.37	240,143,843.94
3	67,898.68	77,935.13	24,329.25	72,204.76	29,151.40	27,197.85	54,700.06	17,465.14	13,022.86	1,267,489,320.78
4	68,507.00	91,798.03	24,944.83	75,325.92	42,875.16	47,889.89	60,241.32	30,596.96	15,752.38	1,533,147,563.60
5	90,922.72	109,648.69	30,194.83	93,325.92	49,064.88	61,597.50	71,679.59	31,788.40	19,083.08	1,857,318,209.26
6	105,243.50	115,206.88	32,932.33	102,129.08	54,111.68	73,851.46	86,479.59	38,227.50	21,666.74	2,108,780,888.23
7	141,367.91	136,149.49	33,513.33	126,081.08	61,097.35	74,645.74	92,020.85	41,196.50	24,794.39	2,413,188,148.46
8	143,016.29	146,836.16	34,140.81	177,495.08	72,855.35	81,355.97	105,933.35	44,792.13	28,770.17	2,800,143,467.50
9	189,146.39	169,506.63	46,539.35	179,957.40	88,193.38	103,843.33	146,615.88	51,492.34	34,659.73	3,373,362,135.68
10	190,649.73	177,979.96	374,239.35	1,073,177.40	104,791.34	122,057.02	148,440.88	53,366.71	87,385.44	8,505,049,941.08
NPV (Baht)	377,799.15	466,212.40	241,012.49	877,021.62	193,371.26	249,614.62	368,084.52	116,210.02	106,321.73	10,348,081,089.20
IRR (%)	23%	31%	23%	32%	22%	25%	32%	22%	27.2%	27.2%
Payback period (Year)	5.3	4.2	5.7	4.9	5.1	4.6	3.9	5.1	4.9	4.9
Discount rate	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
									NPV per rai	106,321.73
									NPV 97,328 rai	10,348,081,089.20
									At 50% success	5,174,040,544.60

Area (Rai)	Initial Investment Public + Farmer (Baht)	NPV (Baht)	IRR (%)	Payback period (Years)
1	41,188.90	106,321.73	27.2	4.9
97,328	4,008,253.77	10,348,081,089.20		
At 50% dropout, NPV = 5,174,040,544.60				

4.4 Discussion

From the farm-level financial analysis, the numbers show that the NTA project is worth the investment. Farming takes at least two years to generate positive net income from agricultural products. As a result, farmers' income declined in the first two years. However, farmer household expenditures also declined. Therefore, from the third year onwards, the farmers' net incomes will increase compared to monocropping.



In summary:

- Government public investment of 2.61 billion baht plus farmers' additional private investment of 1.39 billion baht = Total initial investment of 4 billion baht
- At 50% of dropout rates (from surveys) implied 50% of 27,117 plots continued NTA farming
- If evaluating the investment for 10 years by deducting the net profit received from monoculture farming each year, this investment will yield a net present value (NPV) of 5.17 billion baht with a payback period of 4 - 5 years.
- With NTA water reservoirs, smallholder farmers can improve farm production while creating higher yields and economic security from the multi-crops model in the long run.
- In summary, farmers can make better use of their own farmland due to increased water storage area. In the long run, these water reservoirs will lead to higher yields and economic security.

5. Project Overall Assessment and Lessons Learned

5.1 Strengths

- **Leaving No One Behind** by building Food Security and Self-Sufficiency for those affected by COVID-19.
- **Increase integrated farmland** and improve land and water management towards sustainability.
- **Increase climate adaptation** potential to climate change for smallholder farmers.

5.2 Drawbacks

- **Rushing to prepare**, hence leading to many adjustments later. Rush in preparation led to several alterations later.
- **One size could not fit all**. Lack of flexibility to adapt to the context of each area
- **Inadequate capacity building** in particular knowledge and skill development necessary for implementing integrated farming
- **Insufficient extension support** for agricultural inputs and lack of continuity

1.3 Contribution to SDGs and NDCs achievement

Environment aspect

- The multi-crop model's contribution to climate-related goals can be improved if such a model can be tailored to area-specific conditions.
- The potential for the multi-crop model to support green recovery and climate resilience can be enhanced with continued program support (for 2-3 more years)

Economic aspect

- The potential for the multi-crop model to support food security for small scale farmers and decent work in rural area can be expanded with continued program support (2-3 years) to ensure farmer's self-reliance.

Social aspect

- Trainings on multi-crop model can further integrate the knowledge on climate change to enable effective climate action by farmers.
- Capacity enhancement on multi-crop model enable female farmers to generate higher income.

6. Project-Based Recommendations

6.1 Process improvement

Recommendations on project design or planning and implementation process for the OT-ONTAG project are as follows.

- **Decentralization for a more geography-based approach:** Project planning and implementation should be decentralized to the provincial level. Project officers, especially managerial positions, should have substantial knowledge of SDGs and NDCs, and be effectively applied in designing and planning the project. With the proper knowledge, technical details of the project and activities will be designed to have more impact on achieving the national goals effectively.
- **Increase flexibility in implementation:** The qualifications of the target group should be more flexible, allowing those farmers with different types of land entitlement to be able to join the project. The designed water reservoir shapes should be more flexible and incorporating how to manage those excavating soil within the project's activities and costing. Moreover, selection of plants, livestock, fish should also be decentralized to local management.
- **Design the timing of project implementation suitable with seasonal conditions** in Thailand, with sufficient time to improve soil conditions for plants and fish farming. Thus, the timing and timeline of the project are not suitable with the seasonal conditions in Thailand. Moreover, there should have sufficient time in improving soil conditions of the ponds to be suitable for fish farming. We propose a plan for the project as follows:

	Month	Activities
Year 1	August - September	PR and farmers recruitment
	October (Starting a fiscal year)	Finalize a list of farmers who qualified the target group criteria. The Department of Land Development start surveying the agricultural plots to verify the qualifications
	November - December	Training and communications to ensure prospect farmers have the right understanding of integrated farming and confirm their joining of the project
Year 2	January – March (Dry season)	Digging the ponds
	April - June	Improve soil and water conditions
	July	Support inputs (fisheries, crops, livestock)

6.2 Capacity building

- Design a 3–5-year project with **continuing extension support** for existing target groups, while coordinating budget among relevant agencies within the Ministry. Extension activities such as supporting knowledge and production factors are necessary for sustaining the outcomes and impacts of the project.
- **Provide knowledge and information** related to intercropping management & circular farming will reduce dropouts and create sufficient income for target groups through a combination of several crops and produces. For example, knowledge about the cause of the damage to a particular crop, the general principles of pest control, or the ways in which manure and compost are broken down to provide plant nutrients are all areas of knowledge that the agent can usefully bring to farmers.
- Capacity building related to **technical skills** are also needed to progress towards smart farming. For example, technical skills to operate unfamiliar equipment, organizational skills to manage a group project, the skill to assess the economic aspects of technical advice given, or farm management skills for keeping records and allocating the use of farm resources and equipment.

6.3 Research and innovation: towards BCG model

- Climate resilience: enhance **climate knowledge of all relevant stakeholders**, with technical support for more climate-resilient agricultural practices for farmers.
- Climate change mitigation: research, knowledge management & dissemination to support integrated farming processes including **suitable combination of crops** that not only increase yields but also environmentally friendly.

6.4 Transformative partnerships

- Thailand has vast experiences in providing extension support to smallholder farmers to be able to stand on their own feet via coop or group forming, and product marketing. Those **collective actions** of the government, private sector and civil society are essential for NTA farmers to be successful in integrated farming.
- **Extension workers** should work closely with farmers, helping them to take the initiative and generally encouraging them to become involved in extension activities. Equally important is to convince farmers that they can do things for themselves, that they can make decisions and that they have the ability to break out of their poverty. The mindset of “Can Do” is necessary for farmers to work hard to increase yields and overcome difficulties.
- We recommend the MOAC providing **more of extension support as a transformative partnership with an aim to assist the NTA farmers to be self-reliant within 3-5 years**. The Ministry could link target group farmers with mentors and sustainable farm networks to support the continuity of productive farming for at least 2-3 years.

6.5 Financial sustainability

- Green lending with low interest for NTA farmers to change towards **agroforestry** in the integrated farming as the agroforestry strongly to support the nation in achieving both SDGs and the NDCs

6.6 Matrix (recommendations relevance checklist)

	Relevance & coherence	Efficiency	Effectiveness	Impacts	Sustainability
Process improvement	/	/	/	/	
Capacity building	/		/	/	/
Transformative partnerships			/	/	/
Research and innovation			/	/	
Financial sustainability				/	/

Appendix

Farm-level Financial Analysis of the OT-ONTAG Project

Plot 1 (A1) is located in Bang Pa-In District, Ayutthaya Province. The owner is a 50-year-old female farmer. There are 3 family members, and 2 members work in the plot. The total agricultural area is 6 rai, and the participating area is 5 rai. In the future, she wants to develop the plot into an agricultural tourism destination. The assumptions, projected income, costs, and net income are as follows.

List		Area (rai)	Amount (plant or animal)	Output	Unit	Time of production per year	Output per year	Unit price
After joining the project		5.00						
1	Banana	0.15	30.00	223.20	bunch	1.00	223.20	60.00
2	Custard apple	0.01	2.00	11.76	kilogram	2.00	23.53	30.00
3	Coconut	2.25	45.00	5,546.25	fruit	2.00	11,092.50	12.00
4	Guava	0.11	5.00	338.44	kilogram	2.00	676.89	25.00
5	Rambutan	0.15	3.00	121.80	kilogram	1.00	121.80	20.00
6	Mangosteen	0.10	3.00	167.06	kilogram	1.00	167.06	20.00
7	Mitragyna speciosa / Kratom	0.20	20.00	40.00	-	12.00	480.00	150.00
8	Bamboo	0.25	20.00	20.00	plant	-	-	2,990.00
9	Acacia mangium	0.02	3.00	3.00	plant	-	-	148.37
10	Krathin Thep Narong	0.16	4.00	4.00	plant	-	-	4,049.00
11	Tilapia	-	2,000.00	700.00	kilogram	1.00	700.00	30.00
12	Catfish	-	200.00	72.00	kilogram	2.00	144.00	35.00
Before joining the project		5.00						
	Rice	5.00	-	3,500.00	kilogram	2.00	7,000.00	6.70

A1 Plot: 10-year projected income before and after joining the project

List	Income									
	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
After joining the project										
1	Banana	8,035.20	8,035.20	9,374.40	9,374.40	9,374.40	10,713.60	10,713.60	10,713.60	13,392.00
2	Custard apple	-	-	494.12	494.12	494.12	564.71	564.71	564.71	705.88
3	Coconut	-	-	53,244.00	53,244.00	66,555.00	79,866.00	106,488.00	106,488.00	133,110.00
4	Guava	8,461.11	8,461.11	10,153.33	10,153.33	11,845.56	11,845.56	13,537.78	13,537.78	16,922.22
5	Rambutan	-	-	1,218.00	1,218.00	1,461.60	1,461.60	1,705.20	1,948.80	2,436.00
6	Mangosteen	-	-	1,002.38	1,704.04	1,704.04	1,704.04	1,670.63	2,840.06	2,840.06
7	Mitragyna speciosa / Kratom	-	-	43,200.00	43,200.00	50,400.00	50,400.00	57,600.00	57,600.00	72,000.00
8	Bamboo	-	-	-	-	-	-	-	-	-
9	Acacia mangium	-	-	-	-	-	-	445.11	-	-
10	Krathin Thep Narong	-	-	-	-	-	-	-	-	-
11	Tilapia	16,800.00	18,900.00	21,000.00	21,000.00	21,000.00	21,000.00	21,000.00	21,000.00	21,000.00
12	Catfish	4,032.00	4,032.00	5,040.00	5,040.00	5,040.00	5,040.00	5,040.00	5,040.00	5,040.00
		37,328.31	39,428.31	144,726.23	145,427.89	167,874.71	182,595.50	218,319.91	220,178.06	267,446.17
Before joining the project										
	Rice	46,900.00	46,900.00	46,900.00	46,900.00	46,900.00	46,900.00	46,900.00	46,900.00	46,900.00

A1 Plot: 10-year projected costs before and after joining the project

List		Cost									
		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
After joining the project											
1	Banana	2,549.49	2,549.49	2,549.49	2,549.49	2,549.49	2,549.49	2,549.49	2,549.49	2,549.49	2,549.49
2	Custard apple	2,023.73	1,440.98	1,585.07	1,585.07	1,585.07	1,585.07	1,585.07	1,585.07	1,585.07	1,585.07
3	Coconut	38,418.75	25,143.75	27,658.13	27,658.13	27,658.13	27,658.13	27,658.13	27,658.13	27,658.13	27,658.13
4	Guava	2,283.33	780.00	811.11	904.44	935.56	1,335.56	935.56	951.11	2,283.33	780.00
5	Rambutan	1,992.80	1,812.80	1,994.08	1,994.08	1,994.08	1,994.08	1,994.08	1,994.08	1,994.08	1,994.08
6	Mangosteen	2,547.48	2,247.48	2,472.23	2,472.23	2,472.23	2,472.23	2,472.23	2,472.23	2,472.23	2,472.23
7	Mitragyna speciosa / Kratom	3,200.00	2,400.00	2,400.00	2,400.00	2,400.00	2,400.00	2,400.00	2,400.00	2,400.00	2,400.00
8	Bamboo	4,000.00	-	-	-	-	-	-	-	-	-
9	Acacia mangium	600.00	-	-	-	-	-	-	194.22	-	-
10	Krathin Thep Narong	800.00	-	-	-	-	-	-	-	-	-
11	Tilapia	14,504.00	14,504.00	14,504.00	14,504.00	14,504.00	14,504.00	14,504.00	14,504.00	14,504.00	14,504.00
12	Catfish	4,753.44	4,753.44	4,753.44	4,753.44	4,753.44	4,753.44	4,753.44	4,753.44	4,753.44	4,753.44
		77,673.02	55,631.94	58,727.55	58,820.88	58,852.00	59,252.00	58,852.00	59,061.77	60,199.77	58,696.44
Before joining the project											
	Rice	28,800.00	28,800.00	28,800.00	28,800.00	28,800.00	28,800.00	28,800.00	28,800.00	28,800.00	28,800.00

A1 Plot 10-year projected net income before and after joining the project and incremental income

List		Net Income									
		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
After joining the project											
1	Banana	5,485.71	5,485.71	6,824.91	6,824.91	6,824.91	8,164.11	8,164.11	8,164.11	10,842.51	10,842.51
2	Custard apple	- 2,023.73	- 1,440.98	- 1,090.96	- 1,090.96	- 1,090.96	- 1,020.37	- 1,020.37	- 1,020.37	- 879.19	- 879.19
3	Coconut	- 38,418.75	- 25,143.75	25,585.88	25,585.88	38,896.88	52,207.88	78,829.88	78,829.88	105,451.88	105,451.88
4	Guava	6,177.78	7,681.11	9,342.22	9,248.89	10,910.00	10,510.00	12,602.22	12,586.67	14,638.89	16,142.22
5	Rambutan	- 1,992.80	- 1,812.80	- 776.08	- 776.08	- 532.48	- 532.48	- 288.88	- 45.28	441.92	441.92
6	Mangosteen	- 2,547.48	- 2,247.48	- 1,469.86	- 768.19	- 768.19	- 768.19	- 801.61	367.83	367.83	367.83
7	Mitragyna speciosa / Kratom	- 3,200.00	- 2,400.00	40,800.00	40,800.00	48,000.00	48,000.00	55,200.00	55,200.00	69,600.00	69,600.00
8	Bamboo	- 4,000.00	-	-	-	-	-	-	-	-	-
9	Acacia mangium	- 600.00	-	-	-	-	-	-	250.89	-	-
10	Krathin Thep Narong	- 800.00	-	-	-	-	-	-	-	-	-
11	Tilapia	2,296.00	4,396.00	6,496.00	6,496.00	6,496.00	6,496.00	6,496.00	6,496.00	6,496.00	6,496.00
12	Catfish	- 721.44	- 721.44	286.56	286.56	286.56	286.56	286.56	286.56	286.56	286.56
		- 40,344.71	- 16,203.63	85,998.68	86,607.00	109,022.72	123,343.50	159,467.91	161,116.29	207,246.39	208,749.73
Before joining the project											
	Rice	18,100.00	18,100.00	18,100.00	18,100.00	18,100.00	18,100.00	18,100.00	18,100.00	18,100.00	18,100.00
Incremental NI		-58,444.71	-34,303.63	67,898.68	68,507.00	90,922.72	105,243.50	141,367.91	143,016.29	189,146.39	190,649.73

Plot 2 (A2) located in Bang Pa-In District, Ayutthaya Province. The owner is a 66-year-old male farmer. There are 11 family members, and only 1 member works in the plot. There is no employment within the plot. The total agricultural area is 9 rai, and the participating area is 5 rai. The assumptions, projected income, costs, and net income are as follows.

List	Area (rai)	Amount (plant or animal)	Output	Unit	Time of production per year	Output per year	Unit Price	
After joining the project		5.00						
1	Cavendish Banana	0.20	40.00	297.60	bunch	1.00	297.60	60.00
2	Sugar-apple	0.06	10.00	58.82	kg.	2.00	117.65	30.00
3	Coconut	1.50	30.00	3,697.50	fruit	2.00	7,395.00	12.00
4	Gauva	0.50	30.00	1,523.00	kg.	2.00	3,046.00	25.00
5	Mango	0.22	10.00	222.22	kg.	1.00	222.22	30.00
6	Avocado	0.12	3.00	34.80	kg.	1.00	34.80	50.00
7	Milk Jujube	0.05	3.00	150.00	kg.	1.00	150.00	25.00
8	Thai eggplant	0.00	4.00	9.43	kg.	3.00	28.30	24.00
9	Chili	0.00	7.00	3.72	kg.	6.00	22.31	60.00
10	Kaffir lime	0.01	4.00	15.01	kg.	1.00	15.01	40.00
11	Lime	0.16	8.00	6,998.40	fruit	2.00	13,996.80	2.00
12	Mitragyna speciosa	0.05	5.00	10.00	-	12.00	120.00	150.00
13	Bamboo	0.38	30.00	30.00	plant	-	-	2,990.00
14	Tilapia	-	1,000.00	350.00	kg.	1.00	350.00	30.00
Total revenue after joining the project								
Before joining the project								
	land for rent	5.00						1,500.00

A2 Plot: 10-year projected income before and after joining the project

List	Income										
	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	
After joining the project											
1	Cavendish Banana	7,142.40	7,142.40	8,928.00	12,499.20	12,499.20	14,284.80	14,284.80	14,284.80	17,856.00	17,856.00
2	Sugar-apple	-	-	1,764.71	2,117.65	2,470.59	2,470.59	2,823.53	2,823.53	3,529.41	3,529.41
3	Coconut	-	-	44,370.00	44,370.00	53,244.00	53,244.00	70,992.00	70,992.00	88,740.00	88,740.00
4	Gauva	30,460.00	30,460.00	38,075.00	45,690.00	45,690.00	45,690.00	45,690.00	53,305.00	53,305.00	53,305.00
5	Mango	-	-	-	2,666.67	2,666.67	3,333.33	4,000.00	4,666.67	5,333.33	6,666.67
6	Avocado	-	-	-	-	1,740.00	1,740.00	1,740.00	1,740.00	1,740.00	1,740.00
7	Milk Jujube	1,500.00	1,500.00	1,875.00	1,875.00	2,250.00	2,250.00	2,625.00	3,000.00	3,375.00	3,750.00
8	Thai eggplant	543.40	543.40	543.40	543.40	543.40	679.25	679.25	679.25	679.25	679.25
9	Chili	1,071.00	1,071.00	1,071.00	1,338.75	1,338.75	1,338.75	1,338.75	1,338.75	1,338.75	1,338.75
10	Kaffir lime	480.30	480.30	480.30	480.30	480.30	600.38	600.38	600.38	600.38	600.38
11	Lime	13,996.80	16,796.16	16,796.16	16,796.16	22,394.88	22,394.88	22,394.88	22,394.88	27,993.60	27,993.60
12	Mitragyna speciosa	-	-	14,400.00	14,400.00	14,400.00	18,000.00	18,000.00	18,000.00	18,000.00	18,000.00
13	Bamboo	-	-	-	-	-	-	-	-	-	-
14	Tilapia	5,250.00	5,250.00	6,300.00	6,300.00	7,350.00	8,400.00	8,400.00	10,500.00	10,500.00	10,500.00
		60,443.90	63,243.26	134,603.56	149,077.12	167,067.78	174,425.97	193,568.58	204,325.25	232,990.72	234,699.05
Before joining the project											
	land for rent	7,500.00	7,500.00	7,500.00	7,500.00	7,500.00	7,500.00	7,500.00	7,500.00	7,500.00	7,500.00

A2 Plot: 10-year projected costs before and after joining the project

List		Cost									
		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
After joining the project											
1	Cavendish Banana	3,399.32	2,549.49	2,549.49	2,549.49	2,549.49	2,549.49	2,549.49	2,549.49	2,549.49	2,549.49
2	Sugar-apple	10,118.65	14,409.76	2,881.95	2,881.95	2,881.95	2,881.95	2,881.95	2,881.95	2,881.95	2,881.95
3	Coconut	25,612.50	17,880.00	17,880.00	17,880.00	17,880.00	17,880.00	17,880.00	17,880.00	17,880.00	17,880.00
4	Gauva	10,275.00	3,510.00	3,650.00	4,070.00	4,210.00	6,010.00	4,210.00	4,280.00	10,275.00	3,510.00
5	Mango	2,706.57	1,906.57	1,906.57	2,097.23	2,097.23	2,097.23	2,097.23	2,097.23	2,097.23	2,097.23
6	Avocado	1,150.68	760.68	760.68	760.68	760.68	760.68	760.68	760.68	760.68	760.68
7	Milk Jujube	1,536.80	1,259.06	1,259.06	1,259.06	1,259.06	1,259.06	1,259.06	1,259.06	1,259.06	1,259.06
8	Thai eggplant	115.85	115.85	115.85	115.85	115.85	115.85	115.85	115.85	115.85	115.85
9	Chili	82.36	82.36	82.36	82.36	82.36	82.36	82.36	82.36	82.36	82.36
10	Kaffir lime	322.48	322.48	322.48	322.48	322.48	322.48	322.48	322.48	322.48	322.48
11	Lime	855.99	855.99	855.99	855.99	855.99	855.99	855.99	855.99	855.99	855.99
12	Mitragyna speciosa	2,600.00	2,400.00	2,400.00	2,400.00	2,400.00	2,400.00	2,400.00	2,400.00	2,400.00	2,400.00
13	Bamboo	6,000.00	-	-	-	-	-	-	-	-	-
14	Tilapia	7,252.00	14,504.00	14,504.00	14,504.00	14,504.00	14,504.00	14,504.00	14,504.00	14,504.00	14,504.00
		72,028.19	60,556.25	49,168.43	49,779.09	49,919.09	51,719.09	49,919.09	49,989.09	55,984.09	49,219.09
Before joining the project											
	land for rent	-	-	-	-	-	-	-	-	-	-

A2 Plot 10-year projected net income before and after joining the project and incremental income

List		Net Income = Income - Cost									
		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
After joining the project											
1	Cavendish Banana	3,743.08	4,592.91	6,378.51	9,949.71	9,949.71	11,735.31	11,735.31	11,735.31	15,306.51	15,306.51
2	Sugar-apple	-	10,118.65	-	1,117.25	-	764.31	-	411.36	-	411.36
3	Coconut	-	25,612.50	-	17,880.00	26,490.00	26,490.00	35,364.00	35,364.00	53,112.00	53,112.00
4	Gauva	20,185.00	26,950.00	34,425.00	41,620.00	41,480.00	39,680.00	41,480.00	49,025.00	43,030.00	49,795.00
5	Mango	-	2,706.57	-	1,906.57	569.44	569.44	1,236.11	1,902.77	2,569.44	3,236.11
6	Avocado	-	1,150.68	-	760.68	760.68	979.32	979.32	979.32	979.32	979.32
7	Milk Jujube	-	36.80	240.94	615.94	615.94	990.94	990.94	1,365.94	1,740.94	2,115.94
8	Thai eggplant	427.55	427.55	427.55	427.55	427.55	563.40	563.40	563.40	563.40	563.40
9	Chili	988.64	988.64	988.64	1,256.39	1,256.39	1,256.39	1,256.39	1,256.39	1,256.39	1,256.39
10	Kaffir lime	157.82	157.82	157.82	157.82	157.82	277.90	277.90	277.90	277.90	277.90
11	Lime	13,140.81	15,940.17	15,940.17	15,940.17	21,538.89	21,538.89	21,538.89	21,538.89	27,137.61	27,137.61
12	Mitragyna speciosa	-	2,600.00	-	2,400.00	12,000.00	12,000.00	12,000.00	15,600.00	15,600.00	15,600.00
13	Bamboo	-	6,000.00	-	-	-	-	-	-	-	-
14	Tilapia	-	2,002.00	-	9,254.00	8,204.00	8,204.00	7,154.00	6,104.00	4,004.00	4,004.00
		-	11,584.30	2,687.01	85,435.13	99,298.03	117,148.69	122,706.88	143,649.49	154,336.16	177,006.63
Before joining the project											
	land for rent	7,500.00	7,500.00	7,500.00	7,500.00	7,500.00	7,500.00	7,500.00	7,500.00	7,500.00	7,500.00

Plot 3 (P1) is located in the Thai Mueang District, Phang Nga Province. The owner is a 66-year-old male farmer. There are 5 family members, and 2 members work in the plot. The total agricultural area is 20 rai, and the participating area is 3 rai. The assumptions, projected income, costs, and net income are as follows.

List		Amount (plant or animal)	Output	Unit	Time of production per year	Output per year	Unit Price
After joining the project							
1	Papaya	5.00	250.00	fruit	10.00	2,500.00	21.00
2	Yangna	50.00	50.00	plant		-	1,550.00
3	Mahogany	60.00	60.00	plant		-	4,170.00
4	Tilapia	400.00	140.00	kg	1.00	140.00	43.97
5	Red Tilapia Fish	40.00	25.20	kg	2.00	50.40	75.00
6	Giant freshwater prawn	200.00	4.62	kg	2.00	9.24	270.00
7	Carp	500.00	87.50	kg	1.00	87.50	40.00
8	Seven stripped carp	200.00	70.00	kg	1.00	70.00	33.00
9	Duck	15.00	15.00	egg	365.00	5,475.00	5.00
Before joining the project							
	Rubber tree	-	701.37	nn.	1.00	701.37	23.80

P1 Plot: 10-year projected income before and after joining the project

List	Income										
	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	
After joining the project											
1	Papaya	31,500.00	31,500.00	36,750.00	36,750.00	42,000.00	42,000.00	42,000.00	42,000.00	52,500.00	52,500.00
2	Yangna	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	77,500.00
3	Mahogany	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	250,200.00
4	Tilapia	3,077.90	3,693.48	3,693.48	4,309.06	4,309.06	4,309.06	4,309.06	4,309.06	4,924.64	4,924.64
5	Red Tilapia Fish	1,890.00	2,268.00	2,646.00	2,646.00	2,646.00	2,646.00	3,024.00	2,646.00	2,646.00	2,646.00
6	Giant freshwater prawn	1,247.40	1,496.88	1,746.36	1,746.36	1,746.36	1,746.36	1,746.36	1,995.84	2,494.80	2,494.80
7	Carp	1,750.00	2,100.00	2,450.00	2,450.00	2,450.00	2,450.00	2,800.00	2,800.00	3,500.00	3,500.00
8	Seven stripped carp	1,155.00	1,386.00	1,617.00	1,617.00	1,617.00	1,617.00	1,848.00	1,848.00	2,310.00	2,310.00
9	Duck	19,162.50	19,162.50	19,162.50	19,162.50	19,162.50	21,900.00	21,900.00	21,900.00	21,900.00	21,900.00
		59,782.80	61,606.86	68,065.34	68,680.92	73,930.92	76,668.42	77,249.42	77,876.90	90,275.44	417,975.44
Before joining the project											
	Rubber tree	16,692.61	16,692.61	16,692.61	16,692.61	16,692.61	16,692.61	16,692.61	16,692.61	16,692.61	16,692.61

P1 Plot: 10-year projected costs before and after joining the project

List		Cost									
		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
After joining the project											
1	Papaya	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00
2	Yangna	10,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Mahogany	12,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Tilapia	2,900.80	2,900.80	2,900.80	2,900.80	2,900.80	2,900.80	2,900.80	2,900.80	2,900.80	2,900.80
5	Red Tilapia Fish	3,190.82	3,190.82	3,190.82	3,190.82	3,190.82	3,190.82	3,190.82	3,190.82	3,190.82	3,190.82
6	Giant freshwater prawn	1,447.45	1,447.45	1,447.45	1,447.45	1,447.45	1,447.45	1,447.45	1,447.45	1,447.45	1,447.45
7	Carp	2,331.88	2,331.88	2,331.88	2,331.88	2,331.88	2,331.88	2,331.88	2,331.88	2,331.88	2,331.88
8	Seven stripped carp	1,458.57	1,458.57	1,458.57	1,458.57	1,458.57	1,458.57	1,458.57	1,458.57	1,458.57	1,458.57
9	Duck	27,270.00	27,270.00	27,270.00	27,270.00	27,270.00	27,270.00	27,270.00	27,270.00	27,270.00	27,270.00
		63,599.52	41,599.52	41,599.52	41,599.52	41,599.52	41,599.52	41,599.52	41,599.52	41,599.52	41,599.52
Before joining the project											
	Rubber tree	14,556.03	14,556.03	14,556.03	14,556.03	14,556.03	14,556.03	14,556.03	14,556.03	14,556.03	14,556.03

P1 Plot 10-year projected net income before and after joining the project and incremental income

List		Net Income = Income - Cost									
		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
After joining the project											
1	Papaya	28,500.00	28,500.00	33,750.00	33,750.00	39,000.00	39,000.00	39,000.00	39,000.00	49,500.00	49,500.00
2	Yangna	10,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	77,500.00
3	Mahogany	-12,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	250,200.00
4	Tilapia	177.10	792.68	792.68	1,408.26	1,408.26	1,408.26	1,408.26	1,408.26	2,023.84	2,023.84
5	Red Tilapia Fish	1,300.82	922.82	544.82	-544.82	-544.82	-544.82	-544.82	-166.82	544.82	544.82
6	Giant freshwater prawn	-200.05	49.43	298.91	298.91	298.91	298.91	298.91	548.39	1,047.35	1,047.35
7	Carp	-581.88	231.88	118.13	118.13	118.13	118.13	468.13	468.13	1,168.13	1,168.13
8	Seven stripped carp	-303.57	72.57	158.43	158.43	158.43	158.43	389.43	389.43	851.43	851.43
9	Duck	8,107.50	-8,107.50	-8,107.50	-8,107.50	-8,107.50	-5,370.00	-5,370.00	-5,370.00	-5,370.00	-5,370.00
		-3,816.72	20,007.35	26,465.83	27,081.41	32,331.41	35,068.91	35,649.91	36,277.39	48,675.93	376,375.93
Before joining the project											
	Rubber tree	2,136.58	2,136.58	2,136.58	2,136.58	2,136.58	2,136.58	2,136.58	2,136.58	2,136.58	2,136.58
Incremental Net Income		-5,953.29	17,870.77	24,329.25	24,944.83	30,194.83	32,932.33	33,513.33	34,140.81	46,539.35	374,239.35

Plot 4 (P2) is located in the Thai Mueang District, Phang Nga Province. The owner is a 48-year-old male farmer. There are 4 family members, and 2 members work in the plot. The total agricultural area is 11 rai, and the participating is 3 rai. The assumptions, projected income, costs, and net income are as follows.

List		Area (rai)	Amount (plant or animal)	Output	Unit	Time of production per year	Output per year	Price
After joining the project		3.00						
1	Kratom	1.00	100.00	200.00	plant	6.00	1,200.00	150.00
2	Banana	0.50	100.00	744.00	bunch	1.00	744.00	80.00
3	Mahogany	0.30	60.00	60.00	plant	10 years	4,170.00	250,200.00
4	Champhong	0.25	50.00	50.00	plant	10 years	10,000.00	500,000.00
5	Neem	0.35	70.00	70.00	plant	12 years	10,000.00	700,000.00
6	Azadirachta excelsa	0.25	50.00	50.00	plant	10 years	2,000.00	100,000.00
7	Tilapia		800.00	280.00	kg	1.00	280.00	43.97
8	Red Tilapia Fish		200.00	126.00	kg	2.00	252.00	75.00
9	Frog		300.00	60.00	kg	3.00	180.00	90.00
Before joining the project								
	Rubber tree	3.00	-	701.37	kg	1.00	701.37	23.80

P2 Plot: 10-year projected income before and after joining the project

List	Income										
	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	
After joining the project											
1	Kratom	0.00	0.00	72,000.00	72,000.00	90,000.00	90,000.00	108,000.00	144,000.00	144,000.00	180,000.00
2	Banana	29,760.00	29,760.00	35,712.00	35,712.00	35,712.00	41,664.00	47,616.00	59,520.00	59,520.00	59,520.00
3	Mahogany	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	250,200.00
4	Champhong	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	500,000.00
5	Neem	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Azadirachta excelsa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100,000.00
7	Tilapia	7,386.96	7,386.96	7,386.96	8,618.12	8,618.12	9,849.28	9,849.28	9,849.28	12,311.60	12,311.60
8	Red Tilapia Fish	9,450.00	9,450.00	11,340.00	13,230.00	13,230.00	13,230.00	13,230.00	15,120.00	15,120.00	18,900.00
9	Frog	8,100.00	8,100.00	9,720.00	9,720.00	9,720.00	11,340.00	11,340.00	12,960.00	12,960.00	16,200.00
		54,696.96	54,696.96	136,158.96	139,280.12	157,280.12	166,083.28	190,035.28	241,449.28	243,911.60	1,137,131.60
Before joining the project											
	Rubber tree	16,692.61	16,692.61	16,692.61	16,692.61	16,692.61	16,692.61	16,692.61	16,692.61	16,692.61	16,692.61

P2 Plot: 10-year projected costs before and after joining the project

List		Cost									
		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
After joining the project											
1	Kratom	28,000.00	24,000.00	24,000.00	24,000.00	24,000.00	24,000.00	24,000.00	24,000.00	24,000.00	24,000.00
2	Banana	8,498.30	8,498.30	8,498.30	8,498.30	8,498.30	8,498.30	8,498.30	8,498.30	8,498.30	8,498.30
3	Mahogany	12,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Champathong	10,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Neem	14,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Azadirachta excelsa	10,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	Tilapia	5,801.60	5,801.60	5,801.60	5,801.60	5,801.60	5,801.60	5,801.60	5,801.60	5,801.60	5,801.60
8	Red Tilapia Fish	12,022.92	12,022.92	12,022.92	12,022.92	12,022.92	12,022.92	12,022.92	12,022.92	12,022.92	12,022.92
9	Frog	11,494.80	11,494.80	11,494.80	11,494.80	11,494.80	11,494.80	11,494.80	11,494.80	11,494.80	11,494.80
		111,817.62	61,817.62	61,817.62	61,817.62	61,817.62	61,817.62	61,817.62	61,817.62	61,817.62	61,817.62
Before joining the project											
	Rubber tree	14,556.03	14,556.03	14,556.03	14,556.03	14,556.03	14,556.03	14,556.03	14,556.03	14,556.03	14,556.03

P2 Plot: 10-year projected net income before and after joining the project and incremental income

List		Net Income = Income - Cost									
		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
After joining the project											
1	Kratom	28,000.00	24,000.00	48,000.00	48,000.00	66,000.00	66,000.00	84,000.00	120,000.00	120,000.00	156,000.00
2	Banana	21,261.70	21,261.70	27,213.70	27,213.70	27,213.70	33,165.70	39,117.70	51,021.70	51,021.70	51,021.70
3	Mahogany	12,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	250,200.00
4	Champathong	10,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	500,000.00
5	Neem	14,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Azadirachta excelsa	10,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100,000.00
7	Tilapia	1,585.36	1,585.36	1,585.36	2,816.52	2,816.52	4,047.68	4,047.68	4,047.68	6,510.00	6,510.00
8	Red Tilapia Fish	2,572.92	2,572.92	682.92	1,207.08	1,207.08	1,207.08	1,207.08	3,097.08	3,097.08	6,877.08
9	Frog	3,394.80	3,394.80	1,774.80	1,774.80	1,774.80	154.80	154.80	1,465.20	1,465.20	4,705.20
		- 57,120.66	- 7,120.66	74,341.34	77,462.50	95,462.50	104,265.66	128,217.66	179,631.66	182,093.98	1,073,313.98
Before joining the project											
	Rubber tree	2,136.58	2,136.58	2,136.58	2,136.58	2,136.58	2,136.58	2,136.58	2,136.58	2,136.58	2,136.58
Incremental Net Income		- 59,257.24	- 9,257.24	72,204.76	75,325.92	93,325.92	102,129.08	126,081.08	177,495.08	179,957.40	1,073,177.40

Plot 5 (N1) is located in Chiang Klang District, Nan Province. The owner is a 56-year-old male farmer. There are 4 family members, and 3 members work in the plot. The total agricultural area is 9 rai, and the participating is 3 rai. The assumptions, projected income, costs, and net income are as follows.

List		Area (rai)	Amount (plant or animal)	Output	Unit	Time of production per year	Output per year	Unit Price
After joining the project		3.00						
1	Durian	0.20	5.00	146.79	kg	1.00	146.79	70.00
2	Avocado	0.20	5.00	167.00	kg	1.00	167.00	50.00
3	Long kong	0.07	4.00	22.93	kg	1.00	22.93	50.00
4	Chok Anan mango	0.01	1.00	3.94	kg	3.00	11.82	25.00
5	Banana	0.15	30.00	223.20	bunch	1.00	223.20	60.00
6	Tilapia		700.00	245.00	kg	1.00	245.00	43.97
7	Frog		500.00	100.00	kg	3.00	300.00	90.00
8	Seven stripped carp		2,000.00	700.00	kg	1.00	700.00	35.00
9	Siriped catfish		1,000.00	1,600.00	kg	1.00	1,600.00	40.00
10	Carp		2,000.00	350.00	kg	1.00	350.00	45.00
11	Hens		5.00	5.00	egg	365.00	1,825.00	5.00
Before joining the project								
	Sticky rice	3.00		1,620.00	kg	2.00	3,240.00	9.00

N1 Plot: 10-year projected income before and after joining the project

List	Income									
	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
After joining the project										
1	0.00	0.00	0.00	6,165.26	5,137.72	7,192.81	7,192.81	8,220.35	10,275.44	10,275.44
2	0.00	0.00	0.00	5,010.00	4,175.00	5,010.00	5,010.00	5,845.00	7,515.00	8,350.00
3	0.00	0.00	573.33	688.00	688.00	802.67	917.33	917.33	1,032.00	1,146.67
4	0.00	0.00	177.27	177.27	177.27	206.82	236.36	206.82	236.36	295.46
5	6,696.00	6,696.00	9,374.40	9,374.40	9,374.40	9,374.40	10,713.60	10,713.60	12,052.80	13,392.00
6	5,386.33	5,386.33	6,463.59	6,463.59	7,540.86	7,540.86	8,618.12	8,618.12	10,772.65	10,772.65
7	13,500.00	13,500.00	16,200.00	16,200.00	18,900.00	18,900.00	18,900.00	21,600.00	21,600.00	27,000.00
8	12,250.00	12,250.00	14,700.00	14,700.00	17,150.00	18,375.00	19,600.00	22,050.00	22,050.00	24,500.00
9	32,000.00	35,200.00	38,400.00	44,800.00	44,800.00	44,800.00	48,000.00	51,200.00	57,600.00	64,000.00
10	9,450.00	10,237.50	11,025.00	11,812.50	11,812.50	12,600.00	12,600.00	14,175.00	15,750.00	15,750.00
11	7,300.00	7,300.00	7,300.00	7,300.00	9,125.00	9,125.00	9,125.00	9,125.00	9,125.00	9,125.00
	86,582.33	90,569.83	104,213.60	122,691.03	128,880.75	133,927.55	140,913.23	152,671.22	168,009.25	184,607.21
Before joining the project										
	29,160.00	29,160.00	29,160.00	29,160.00	29,160.00	29,160.00	29,160.00	29,160.00	29,160.00	29,160.00

N1 Plot: 10-year projected costs before and after joining the project

List		Cost									
		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
1	Durian	600.00	1,200.00	1,200.00	3,920.77	3,920.77	3,920.77	3,920.77	3,920.77	3,920.77	3,920.77
2	Avocado	2,375.40	980.00	980.00	2,597.80	2,597.80	2,597.80	2,597.80	2,597.80	2,597.80	2,597.80
3	Long kong	354.53	203.56	237.56	649.23	649.23	649.23	649.23	649.23	649.23	649.23
4	Chok Anan mango	59.26	34.26	34.26	37.68	37.68	37.68	37.68	37.68	37.68	37.68
5	Banana	2,549.49	2,549.49	2,549.49	2,549.49	2,549.49	2,549.49	2,549.49	2,549.49	2,549.49	2,549.49
6	Tilapia	5,076.40	5,076.40	5,076.40	5,076.40	5,076.40	5,076.40	5,076.40	5,076.40	5,076.40	5,076.40
7	Frog	18,158.00	13,158.00	13,158.00	13,158.00	13,158.00	13,158.00	13,158.00	13,158.00	13,158.00	13,158.00
8	Seven stripped carp	5,105.00	5,105.00	5,105.00	5,105.00	5,105.00	5,105.00	5,105.00	5,105.00	5,105.00	5,105.00
9	Siriped catfish	28,984.00	23,984.00	23,984.00	23,984.00	23,984.00	23,984.00	23,984.00	23,984.00	23,984.00	23,984.00
10	Carp	14,327.50	9,327.50	9,327.50	9,327.50	9,327.50	9,327.50	9,327.50	9,327.50	9,327.50	9,327.50
11	Hens	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		77,589.58	61,618.21	61,652.20	66,405.87	66,405.87	66,405.87	66,405.87	66,405.87	66,405.87	66,405.87
Before joining the project											
	Sticky rice	15,750.00	15,750.00	15,750.00	15,750.00	15,750.00	15,750.00	15,750.00	15,750.00	15,750.00	15,750.00

N1 Plot: 10-year projected net income before and after joining the project and incremental income

List		Net Income = Income - Cost									
		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
1	Durian	600.00	1,200.00	1,200.00	2,244.49	1,216.95	3,272.04	3,272.04	4,299.58	6,354.67	6,354.67
2	Avocado	2,375.40	980.00	980.00	2,412.20	1,577.20	2,412.20	2,412.20	3,247.20	4,917.20	5,752.20
3	Long kong	354.53	203.56	335.78	38.77	38.77	153.44	268.10	268.10	382.77	497.44
4	Chok Anan mango	-59.26	34.26	143.01	139.59	139.59	169.13	198.68	169.13	198.68	257.77
5	Banana	4,146.51	4,146.51	6,824.91	6,824.91	6,824.91	6,824.91	8,164.11	8,164.11	9,503.31	10,842.51
6	Tilapia	309.93	309.93	1,387.19	1,387.19	2,464.46	2,464.46	3,541.72	3,541.72	5,696.25	5,696.25
7	Frog	4,658.00	342.00	3,042.00	3,042.00	5,742.00	5,742.00	5,742.00	8,442.00	8,442.00	13,842.00
8	Seven stripped carp	7,145.01	7,145.01	9,595.01	9,595.01	12,045.01	13,270.01	14,495.01	16,945.01	16,945.01	19,395.01
9	Siriped catfish	3,016.00	11,216.00	14,416.00	20,816.00	20,816.00	20,816.00	24,016.00	27,216.00	33,616.00	40,016.00
10	Carp	4,877.50	910.00	1,697.50	2,485.00	2,485.00	3,272.50	3,272.50	4,847.50	6,422.50	6,422.50
11	Hens	7,300.00	7,300.00	7,300.00	7,300.00	9,125.00	9,125.00	9,125.00	9,125.00	9,125.00	9,125.00
		8,992.75	28,951.62	42,561.40	56,285.16	62,474.88	67,521.68	74,507.35	86,265.35	101,603.38	118,201.34
Before joining the project											
	Sticky rice	13,410.00	13,410.00	13,410.00	13,410.00	13,410.00	13,410.00	13,410.00	13,410.00	13,410.00	13,410.00
Incremental Net Income		- 4,417.25	15,541.62	29,151.40	42,875.16	49,064.88	54,111.68	61,097.35	72,855.35	88,193.38	104,791.34

Plot 6 (N2) is located in Chiang Klang District, Nan Province. The owner is a 39-year-old female farmer. There are 3 family members, and 2 members work in the plot. The total agricultural area is 3 rai, and the participating area is 3 rai. The assumptions, projected income, costs and net income are as follows.

List		Area (rai)	Amount (plant or animal)	Output	Unit	Time of production per year	Output per year	Unit Price
After joining the project		3.00						
1	Banana	1.00	200.00	1,488.00	bunch	1.00	1,488.00	60.00
2	Pineapple	0.03	200.00	7,257.50	kg	1.00	7,257.50	15.00
4	Durian	0.20	5.00	146.79	kg	1.00	146.79	65.63
6	Red dragon fruit	0.77	100.00	1,384.62	kg	1.00	1,384.62	15.00
7	Yellow dragon fruit	0.77	100.00	1,384.62	kg	1.00	1,384.62	20.00
8	Tilapia		700.00	245.00	kg	1.00	245.00	43.97
9	Carp		2,000.00	350.00	kg	1.00	350.00	40.00
10	Hen		5.00	5.00	egg	365.00	1,825.00	5.00
Before joining the project								
	Raw land	3.00						

N2 Plot: 10-year projected income before and after joining the project

List	Income										
	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	
After joining the project											
1	Banana	40,176.00	40,176.00	40,176.00	53,568.00	62,496.00	71,424.00	71,424.00	71,424.00	71,424.00	89,280.00
2	Pineapple	0.00	2,322.40	2,322.40	2,322.40	2,322.40	2,612.70	2,612.70	2,903.00	2,903.00	2,903.00
4	Durian	0.00	0.00	0.00	5,780.38	5,780.38	6,743.77	6,743.77	7,707.17	8,670.56	9,633.96
6	Red dragon fruit	6,230.77	8,307.69	10,384.62	12,461.54	12,461.54	14,538.46	14,538.46	16,615.38	20,769.23	20,769.23
7	Yellow dragon fruit	8,307.69	11,076.92	13,846.15	16,615.38	19,384.62	19,384.62	19,384.62	22,153.85	27,692.31	27,692.31
8	Tilapia	5,386.33	5,386.33	5,386.33	5,386.33	5,386.33	5,386.33	5,386.33	5,386.33	10,772.65	10,772.65
9	Carp	7,000.00	7,000.00	8,400.00	8,400.00	9,800.00	9,800.00	11,200.00	11,200.00	14,000.00	14,000.00
10	Hen	5,475.00	5,475.00	5,475.00	5,475.00	5,475.00	5,475.00	5,475.00	5,475.00	9,125.00	9,125.00
		72,575.79	79,744.34	85,990.49	110,009.02	123,106.25	135,364.87	136,764.87	142,864.72	165,356.75	184,176.15
Before joining the project											
	Raw land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

N2 Plot: 10-year projected costs before and after joining the project

List		Cost									
		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
After joining the project											
1	Banana	15,996.60	15,996.65	15,996.60	15,996.60	15,996.60	15,996.60	15,996.60	15,996.60	15,996.60	15,996.60
2	Pineapple	670.86	340.48	345.14	950.86	340.48	345.14	950.86	340.48	345.14	950.86
4	Durian	600.00	1,200.00	1,200.00	3,920.77	3,920.77	3,920.77	3,920.77	3,920.77	3,920.77	3,920.77
6	Red dragon fruit	22,435.88	12,000.00	12,000.00	12,000.00	12,000.00	12,000.00	12,000.00	12,000.00	12,000.00	12,000.00
7	Yellow dragon fruit	22,435.88	12,000.00	12,000.00	12,000.00	12,000.00	12,000.00	12,000.00	12,000.00	12,000.00	12,000.00
8	Tilapia	5,076.40	5,076.40	5,076.40	5,076.40	5,076.40	5,076.40	5,076.40	5,076.40	5,076.40	5,076.40
9	Carp	9,327.50	9,327.50	9,327.50	9,327.50	9,327.50	9,327.50	9,327.50	9,327.50	9,327.50	9,327.50
10	Hen	2,847.00	2,847.00	2,847.00	2,847.00	2,847.00	2,847.00	2,847.00	2,847.00	2,847.00	2,847.00
		79,390.13	58,788.03	58,792.64	62,119.13	61,508.75	61,513.42	62,119.13	61,508.75	61,513.42	62,119.13
Before joining the project											
	Raw land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

N2 Plot: 10-year projected net income before and after joining the project and incremental income

List		Net Income									
		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
After joining the project											
1	Banana	24,179.40	24,179.35	24,179.40	37,571.40	46,499.40	55,427.40	55,427.40	55,427.40	55,427.40	73,283.40
2	Pineapple	-670.86	1,981.92	1,977.26	1,371.54	1,981.92	2,267.56	1,661.84	2,562.52	2,557.86	1,952.14
4	Durian	-600.00	-1,200.00	-1,200.00	1,859.60	1,859.60	2,823.00	2,823.00	3,786.40	4,749.79	5,713.19
6	Red dragon fruit	-16,205.12	-3,692.31	-1,615.38	461.54	461.54	2,538.46	2,538.46	4,615.38	8,769.23	8,769.23
7	Yellow dragon fruit	-14,128.19	-923.08	1,846.15	4,615.38	7,384.62	7,384.62	7,384.62	10,153.85	15,692.31	15,692.31
8	Tilapia	309.93	309.93	309.93	309.93	309.93	309.93	309.93	309.93	5,696.25	5,696.25
9	Carp	-2,327.50	-2,327.50	-927.50	-927.50	472.50	472.50	1,872.50	1,872.50	4,672.50	4,672.50
10	Hen	2,628.00	2,628.00	2,628.00	2,628.00	2,628.00	2,628.00	2,628.00	2,628.00	6,278.00	6,278.00
		-6,814.34	20,956.31	27,197.85	47,889.89	61,597.50	73,851.46	74,645.74	81,355.97	103,843.33	122,057.02
Before joining the project											
	Raw land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Plot 7 (L1) is located in Phu Kradueng District, Loei Province. The owner is a 48-year-old male farmer. There are 4 family members, and 2 members work in the plot. There is no employment within the plot. The total agricultural area is 12 rai, and the area participation in the project is 3 rai. In the future, she will grow crops and wait for the harvest. The assumptions, projected income, costs, and net income are as follows.

List		Area (rai)	Amount (plant or animal)	Output	Unit	Time of production per year	Output per year	Unit Price
After joining the project		3.00						
1	Sugar cane	0.08	300.00	900.00	kg	1.00	900.00	10.00
2	Banana	0.50	100.00	744.00	bunch	1.00	744.00	60.00
3	Kratom	0.05	5.00	10.00	kg	12.00	120.00	150.00
4	Guava	1.56	70.00	2,000.00	kg	2.00	4,000.00	32.50
5	Tilapia		700.00	245.00	kg	1.00	245.00	43.97
6	Hen		5.00	5.00	egg	365.00	1,825.00	5.00
Before joining the project								
	Sticky rice	3.00		1,684.56	kg	2.00	3,369.12	7.48

L1 Plot: 10-year projected income before and after joining the project

List	Income										
	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	
After joining the project											
1	Sugar cane	6,300.00	6,300.00	6,300.00	7,200.00	7,200.00	7,200.00	7,200.00	9,000.00	9,000.00	9,000.00
2	Banana	22,320.00	26,784.00	31,248.00	35,712.00	31,248.00	31,248.00	35,712.00	35,712.00	44,640.00	44,640.00
3	Kratom	0.00	0.00	12,600.00	12,600.00	12,600.00	14,400.00	14,400.00	14,400.00	18,000.00	18,000.00
4	Guava	65,000.00	65,000.00	65,000.00	65,000.00	78,000.00	91,000.00	91,000.00	104,000.00	130,000.00	130,000.00
5	Tilapia	5,386.33	5,386.33	5,386.33	6,463.59	7,540.86	7,540.86	8,618.12	8,618.12	10,772.65	10,772.65
6	Hen	4,562.50	4,562.50	4,562.50	4,562.50	6,387.50	6,387.50	6,387.50	7,300.00	7,300.00	9,125.00
		97,268.83	101,732.83	118,796.83	124,338.09	135,776.36	150,576.36	156,117.62	170,030.12	210,712.65	212,537.65
Before joining the project											
	Sticky rice	25,201.02	25,201.02	25,201.02	25,201.02	25,201.02	25,201.02	25,201.02	25,201.02	25,201.02	25,201.02

L1 Plot: 10-year projected costs before and after joining the project

List		Cost									
		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
After joining the project											
1	Sugar cane	1,200.00	720.00	720.00	1,200.00	720.00	720.00	1,200.00	720.00	720.00	1,200.00
2	Banana	8,498.30	8,498.30	8,498.30	8,498.30	8,498.30	8,498.30	8,498.30	8,498.30	8,498.30	8,498.30
3	Kratom	22,750.00	1,200.00	1,200.00	1,200.00	1,200.00	1,200.00	1,200.00	1,200.00	1,200.00	1,200.00
4	Guava	47,522.22	32,000.00	32,000.00	32,000.00	32,000.00	32,000.00	32,000.00	32,000.00	32,000.00	32,000.00
5	Tilapia	6,125.00	6,125.00	6,125.00	6,125.00	6,125.00	6,125.00	6,125.00	6,125.00	6,125.00	6,125.00
6	Hen	2,847.00	2,847.00	2,847.00	2,847.00	2,847.00	2,847.00	2,847.00	2,847.00	2,847.00	2,847.00
		87,742.52	50,670.30	50,670.30	50,670.30	50,670.30	50,670.30	50,670.30	50,670.30	50,670.30	50,670.30
Before joining the project											
	Sticky rice	11,774.55	11,774.55	11,774.55	11,774.55	11,774.55	11,774.55	11,774.55	11,774.55	11,774.55	11,774.55

L1 Plot: 10-year projected net income before and after joining the project and incremental income

List		Net Income									
		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
After joining the project											
1	Sugar cane	5,100.00	5,580.00	5,580.00	6,000.00	6,480.00	6,480.00	6,000.00	8,280.00	8,280.00	7,800.00
2	Banana	13,821.70	18,285.70	22,749.70	27,213.70	22,749.70	22,749.70	27,213.70	27,213.70	36,141.70	36,141.70
3	Kratom	-22,750.00	-1,200.00	11,400.00	11,400.00	11,400.00	13,200.00	13,200.00	13,200.00	16,800.00	16,800.00
4	Guava	17,477.78	33,000.00	33,000.00	33,000.00	46,000.00	59,000.00	59,000.00	72,000.00	98,000.00	98,000.00
5	Tilapia	-738.68	-738.68	-738.68	338.59	1,415.86	1,415.86	2,493.12	2,493.12	4,647.65	4,647.65
6	Hen	1,715.50	1,715.50	1,715.50	1,715.50	3,540.50	3,540.50	3,540.50	4,453.00	4,453.00	6,278.00
		9,526.30	51,062.53	68,126.53	73,667.79	85,106.06	99,906.06	105,447.32	119,359.82	160,042.35	161,867.35
Before joining the project											
	Sticky rice	13,426.47	13,426.47	13,426.47	13,426.47	13,426.47	13,426.47	13,426.47	13,426.47	13,426.47	13,426.47
Incremental net Income		-3,900.16	37,636.06	54,700.06	60,241.32	71,679.59	86,479.59	92,020.85	105,933.35	146,615.88	148,440.88

Plot 8 (L2) is located in Phu Kradueng District, Loei Province. The owner is a 52-year-old female farmer. There are 5 family members, and 4 members work in the plot. The total agricultural area is 35 rai, and the participating is 3 rai. The assumptions, projected income, costs, and net income are as follows.

List		Area (rai)	Amount (plant or animal)	Output	Unit	Time of production per year	Output per year	Unit Price
1	Banana	0.10	20.00	148.80	bunch	1.00	148.80	60.00
2	Rambutan	0.25	5.00	203.00	kg	1.00	203.00	47.50
3	Mango	0.04	2.00	44.44	kg	1.00	44.44	90.00
4	Longan	0.08	2.00	49.67	kg	1.00	49.67	40.00
5	Coconut	0.25	5.00	616.25	fruit	2.00	1,232.50	12.00
6	Lychee	0.08	2.00	35.52	kg	1.00	35.52	60.00
7	Tamarind	0.08	2.00	60.77	kg	1.00	60.77	80.00
8	Jujube	0.05	3.00	150.00	kg	1.00	150.00	30.00
9	Guava	0.07	3.00	203.07	kg	2.00	406.13	21.00
10	Tilapia		700.00	245.00	kg	1.00	245.00	43.97
11	Carp		200.00	35.00	kg	1.00	35.00	40.00
12	Hen		5.00	5.00	egg	365.00	1,825.00	5.00
Before joining the project								
Sugar cane		3.00						

L2 Plot: 10-year projected income before and after joining the project

List		Income									
		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
1	Banana	6,249.60	6,249.60	5,356.80	7,142.40	7,142.40	8,928.00	8,928.00	8,928.00	8,928.00	8,928.00
2	Rambutan	0.00	0.00	4,821.25	7,714.00	7,714.00	8,678.25	8,678.25	9,642.50	9,642.50	9,642.50
3	Mango	0.00	0.00	0.00	3,200.00	3,200.00	3,200.00	4,000.00	4,000.00	4,000.00	4,000.00
4	Longan	0.00	0.00	0.00	1,589.40	1,390.73	1,589.40	1,589.40	1,589.40	1,986.75	1,986.75
5	Coconut	0.00	0.00	8,874.00	11,832.00	10,353.00	11,832.00	13,311.00	13,311.00	14,790.00	14,790.00
6	Lychee	0.00	0.00	1,278.72	1,704.96	1,704.96	1,704.96	1,704.96	1,704.96	2,131.20	2,131.20
7	Tamarind	0.00	0.00	0.00	0.00	2,430.94	2,917.13	2,917.13	3,403.32	3,889.51	4,861.89
8	Jujube	2,700.00	2,700.00	2,700.00	3,150.00	3,150.00	3,150.00	3,600.00	3,600.00	4,500.00	4,500.00
9	Guava	4,264.40	4,264.40	5,970.16	5,970.16	5,970.16	6,823.04	6,823.04	6,823.04	8,528.80	8,528.80
10	Tilapia	6,463.59	6,463.59	7,540.86	7,540.86	8,618.12	8,618.12	8,618.12	10,772.65	10,772.65	10,772.65
11	Carp	840.00	840.00	980.00	980.00	1,120.00	1,120.00	1,120.00	1,120.00	1,400.00	1,400.00
12	Hen	5,475.00	5,475.00	6,387.50	6,387.50	6,387.50	7,300.00	7,300.00	7,300.00	9,125.00	9,125.00
		25,992.59	25,992.59	43,909.29	57,211.28	59,181.81	65,860.90	68,589.90	72,194.87	79,694.41	80,666.79
Before joining the project											
Sugar cane		24,989.00	24,989.00	24,989.00	24,989.00	24,989.00	24,989.00	24,989.00	24,989.00	24,989.00	24,989.00

L2 Plot: 10-year projected costs before and after joining the project

List		Cost									
		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
1	Banana	1,699.66	1,699.66	1,699.66	1,699.66	1,699.66	1,699.66	1,699.66	1,699.66	1,699.66	1,699.66
2	Rambutan	3,321.33	3,021.33	3,323.46	3,323.46	3,323.46	3,323.46	3,323.46	3,323.46	3,323.46	3,323.46
3	Mango	381.31	381.31	381.31	381.31	419.45	419.45	419.45	419.45	419.45	419.45
4	Longan	83.94	83.94	83.94	83.94	92.33	92.33	92.33	92.33	92.33	92.33
5	Coconut	4,268.75	3,043.75	3,043.75	3,073.13	3,073.13	3,073.13	3,073.13	3,073.13	3,073.13	3,073.13
6	Lychee	234.80	145.20	215.20	300.00	580.04	580.04	580.04	580.04	580.04	580.04
7	Tamarind	192.78	90.49	90.49	90.49	524.35	524.35	524.35	524.35	524.35	524.35
8	Jujube	1,536.80	1,259.06	1,259.06	1,259.06	1,259.06	1,259.06	1,259.06	1,259.06	1,259.06	1,259.06
9	Guava	1,370.00	468.00	486.67	542.67	561.33	801.33	561.33	570.67	1,370.00	468.00
10	Tilapia	5,076.40	5,076.40	5,076.40	5,076.40	5,076.40	5,076.40	5,076.40	5,076.40	5,076.40	5,076.40
11	Carp	932.75	932.75	932.75	932.75	932.75	932.75	932.75	932.75	932.75	932.75
12	Hen	2,847.00	2,847.00	2,847.00	2,847.00	2,847.00	2,847.00	2,847.00	2,847.00	2,847.00	2,847.00
		21,945.52	19,048.90	19,439.70	19,609.87	20,388.96	20,628.96	20,388.96	20,398.29	21,197.63	20,295.63
	Before joining the project										
	Sugar cane	17,984.55	17,984.55	17,984.55	17,984.55	17,984.55	17,984.55	17,984.55	17,984.55	17,984.55	17,984.55

L2 Plot: 10-year projected net income before and after joining the project and incremental income

List		Net Income									
		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
1	Banana	4,549.94	4,549.94	3,657.14	5,442.74	5,442.74	7,228.34	7,228.34	7,228.34	7,228.34	7,228.34
2	Rambutan	-3,321.33	-3,021.33	1,497.79	4,390.54	4,390.54	5,354.79	5,354.79	6,319.04	6,319.04	6,319.04
3	Mango	-381.31	-381.31	-381.31	2,818.69	2,780.55	2,780.55	3,580.55	3,580.55	3,580.55	3,580.55
4	Longan	-83.94	-83.94	-83.94	1,505.47	1,298.39	1,497.07	1,497.07	1,497.07	1,894.42	1,894.42
5	Coconut	-4,268.75	-3,043.75	5,830.25	8,758.88	7,279.88	8,758.88	10,237.88	10,237.88	11,716.88	11,716.88
6	Lychee	-234.80	-145.20	1,063.52	1,404.96	1,124.92	1,124.92	1,124.92	1,124.92	1,551.16	1,551.16
7	Tamarind	-192.78	-90.49	-90.49	-90.49	1,906.59	2,392.78	2,392.78	2,878.97	3,365.16	4,337.54
8	Jujube	1,163.20	1,440.94	1,440.94	1,890.94	1,890.94	1,890.94	2,340.94	2,340.94	3,240.94	3,240.94
9	Guava	2,894.40	3,796.40	5,483.49	5,427.49	5,408.83	6,021.71	6,261.71	6,252.37	7,158.80	8,060.80
10	Tilapia	1,387.19	1,387.19	2,464.46	2,464.46	3,541.72	3,541.72	3,541.72	5,696.25	5,696.25	5,696.25
11	Carp	-92.75	-92.75	47.25	47.25	187.25	187.25	187.25	187.25	467.25	467.25
12	Hen	2,628.00	2,628.00	3,540.50	3,540.50	3,540.50	4,453.00	4,453.00	4,453.00	6,278.00	6,278.00
		4,047.07	6,943.69	24,469.59	37,601.41	38,792.85	45,231.95	48,200.95	51,796.58	58,496.79	60,371.16
	Before joining the project										
	Sugar cane	7,004.45	7,004.45	7,004.45	7,004.45	7,004.45	7,004.45	7,004.45	7,004.45	7,004.45	7,004.45
	Incremental Net Income	-2,957.38	-60.76	17,465.14	30,596.96	31,788.40	38,227.50	41,196.50	44,792.13	51,492.34	53,366.71

II. Project Evaluation Report

Development of pilot areas for improving quality of life based on New Theory applied to “Kok Nong Na Model”

1. Project Background and Attributes

The project was established as an agricultural development model that has proven to be successful in practice for farmers in various areas across the country. Together, they stimulated the economy from the COVID-19 pandemic, where unemployed workers from the badly hit tourism industry returned to their rural base hometown. Kok Nong Na model was set to become another area-based development alternative to mitigate some of the economic impacts and provide choices for the transition period of the agriculture sector in Thailand. Better utilization of the essential resources for agriculture, water, and cultivating the land was the core success following the application of the sufficiency economy philosophy and the new agriculture theory based on diversity farming. The project is planned to provide a “role model” at the local level, which also serves as a learning center and, later on, as a consultation. Thus, the project was implemented countrywide, and the selected farmers are expected to become mentors for farmers who are interested later. Additionally, knowing that a particular set of farming skills and an understanding of the practice were required to be successful, training programs were provided for the participating farmers and interested volunteer workers. Employment was created as part of the project, and local officers in charge in the local area got a chance to enhance their farming knowledge and understanding, giving them a better attitude and mindset for agricultural area-based development. Over the long run, the collaboration and communication networking between and among farmers and local officers proved to be crucial for future development schemes of the country as a whole.

1.1 Budget: 4,787.91 mil.

1.2 Responsible Agency: Community Development Department, Ministry of Interior

1.3 Descriptions:

The Kok Nong Na (KNN) model is an application of agricultural practice based on the “New Agriculture Theory” initiated in Thailand. Many successful cases have been demonstrated since these underlying principles for farmland management were introduced. The new farming approach ensures that adequate water is available on a year-round activity basis, including both farming and household uses, rather than relying on rain-fed mono-cropping. At the initial stage, the focus of KNN farmers is on self-sufficient practice. Hence, part of the farmland is used for food cultivation, such as daily vegetable supplies, eggs, and fish, as necessary protein sources. Household expenditure will be significantly reduced by

relying less on the market for food. Continuation to the next stage is when the food supply produced within the farmland exceeds the sufficient level, which then can be shared with neighboring households and the community. The “sharing stage” serves as a preparation step where farmers build networks and learn how products harvested from the farmland can be featured in the market. The final stage is when the farmland is used to produce for commercial sale in the local market or urban areas outside of the community.

- An application of the New Agriculture Theory emphasizes improving land utilization through area management. The plot of land was designed so that water, the most essential element in agriculture, could be stored enough for year-round farming. Diversity farming instead of mono-crops was implemented to facilitate self-reliance on household consumption and, in the later stage, guarantee more stable income streams for the household.
- Successful cases of the KNN model had been evidenced prior to the implementation of the project under the rehabilitation loan scheme. It provided great potential and opportunity as a policy measure for policymakers to use the project as an economic stimulus package and initiate the economic development process, especially in rural areas.
- Farmers who participated in the KNN model project, either HLM or CLM, were committed to a five-year period, and each plot was subjected to an annual evaluation by the provincial community development officers. A, B, C, and D grading systems will be assessed in each plot based on the criteria set by the Department of Community Development and the Ministry of Interior.
- Jobs were created temporarily, lasting for about 12 months, with a salary of 9,000 baht per month. The hired workers were trained to become “Development Informant Representative: DIR” (“Nak Pattana Tambon Tonbaab” (นักพัฒนาตำบลแบบ หรือ นพต.) in Thai). Two DIRs were assigned to work with 1 plot of HLM and 10 for CLM. After the end of the program, few DIRs still return to the plots for occasional hiring opportunities by the owner of the HLM or CLM plots. Other indirect job opportunities were also created for economic activities generated by the KNN model practice, such as labor demand in farming and marketing products from the plots.
- In addition to the KNN plots initiated from the project under the rehabilitation loan, a few farmers expressed their interest in following similar practices noticeable by some HLM and CLM plots. Some were those DIRs who were trained in the KNN model project and would like to start practicing on their own plots. One of the objectives and significant contributions of the KNN model is to use these HLM and CLM plots as role models and persuade more farmers with matched characteristics to consider KNN as an alternative approach for development and getting them out of poverty.
- At the age of soaring inflation, the benefits gained from self-sufficient food grown in a farmer’s own field multiplied. Stabilizing food expenses and, in some cases, earning extra income from excess food supplies enhance farmer households' resilience in

uncertain economic conditions. A sufficient food supply for the household is more or less guaranteed as the KNN model practice brings diversity and self-reliance.

Success cases of the KNN model have led to government budget provisions via the Department of Community Development, Ministry of Interior. The outbreak of the COVID-19 pandemic and the lockdown measures in the first half of 2020 prompted concerns over the economic impacts on Thailand, especially for workers who immediately lost their jobs. Lessons learned from the previous economic crisis in 1997 show that the agriculture sector can help mitigate some of the impacts as the economy experienced a flux of labor immigrants from urban back to rural areas searching for jobs and economic opportunities. As a result, the KNN model was proposed and approved for implementation in Thailand's economic rehabilitation package in 2020. Aiming to use the agriculture sector to absorb some of the negative impacts and provide those who were disruptively hit and needed to return to the rural area more sustainably, the project was planned to be a springboard into a transformation of Thailand's agriculture sector. Substantial changes were required to create higher value-added agriculture-based products and simultaneously deal with unsustainable poor farmers in the country. Building productivity and resilience based on improving farmland conditions was vital to the project's success. Implementation of the KNN model project involves 7 broad activities as follows.

1.4 Project Activities

Activity 1: Short up-skill training course on sufficiency economy agriculture development in Kok Nong Na model practice. Three programs are included: (1) Agriculture Development toward a Sufficiency Economy, (2) Sustainable Development of Social Landscape at the Community Level, and (3) Area Design and Management based on Social Landscape. The training program is designed for farmers who intend to participate in the project and for Development Informant Representatives (DIR). Training is a must to get involved in the project. It is an intensive 5-day, 4-night program. The farmer who failed to participate in this training program cannot join the project, and the plot will be withdrawn from the list. This was used as one of the screening mechanisms to select farmers who are serious about the project, willing to work hard, and have enough patience, as it takes time for the KNN model to realize its potential returns fully.

Activity 2: Build areas for community learning labs for quality of living development at Tambon and household level.

Build areas for community learning labs at the Tambon level (Community Lab Model for Quality of Life: CLM) in a total of 337 plots (23 plots with the size of 10 rai and 314 plots with 15 rai) and at the household level (Household Lab Model

for Quality of Life: HLM) total 24,842 plots (9,925 plots with the size of 1 rai and 14,917 plots with 3 rai). The size of the land plot is not evenly distributed. It depends on the farmer to decide what proportion of the land will be brought into the project. In most cases, farmers only use part of their land to participate in the project, and the benefits from reserving enough water for year-round use also spill over to the part not used for the KNN model.

Activity 3: “Creating the trainer for development” Job creation for farmers, workers, newly graduated unemployed, especially return migrant workers. 9,188 positions were hired in the project (as of September 2021).

Activity 4: Stimulate local consumption via “เอามื้อสามัคคี” (“Ao Mue Samukkee” in Thai) activities and support the necessary supplies for the training programs, which were conducted on the KNN model plots. There were 24,842 plots, 3 times in each plot, and 20 participants each time. The activity yields both local circular economy, increased local production and consumption, as a stimulus to more excellent value added to local produces, and opening up opportunities for participants to share and exchange knowledge and experiences of Kok Nong Na and sufficiency economy philosophy practices.

Activity 5: Coordinate integration of the development network. The project allows farmers who join in more opportunities to exchange and share information about their farming experiences by forming an electronic communication network and occasionally meeting in person. Particular networking where HLM and CLM will be used as a center for further sharing activities to become more innovative, especially from the marketing perspectives to expand marketing channel for their products as farmers further advance to the next stage of development.

Activity 6: Develop the “EarthSafe” organic agriculture product standard (Thai organic agriculture product standard), which covers product standards, product processing standards, and marketing of product standards. A training program for the “EarthSafe” organic agriculture product standard was introduced. Most of the agriculture products cultivated from the KNN model farm are nonchemical. However, they might not be organic based on international definitions yet because of the use of chemical substances by the neighboring farms that contaminate the soil. The products from the KNN model can create higher value-added if the products are recognized as nonchemical and penetrate in a specific section of the market.

Activity 7: Develop a digital platform to support the local economy by building software and database systems. This is considered a very later stage of KNN model practice.

Most of the KNN plots in the project have not been able to get to this stage of development just yet. However, some ideas about digital transactions were inserted into the training program just to create awareness of further development.

1.5 Project Status (as of 31 Mar 2022):

Finished (as of 31 March 2022 by the third extension of the project).

1.6 Project objectives

- Support and facilitate the understanding and adoption of the sufficiency economy philosophy in practice with the Kok Nong Na model application
- Developing a community learning center of Kok Nong Na model at the Tambon level and a household learning unit at the household level for sustainable development
- Local economy rehabilitation by income creation for those who were affected by COVID-19, including those who lost their jobs and farmers because of economic contraction (immediate commodity price dropped and demand lost)

1.7 Target Group

Households and communities nationwide that are interested in implementing the Kok Nong Na model practice to improve quality of life. A survey by the Community Development Department in 2019 indicated that over 50,000 households were interested in participating in the project. The responsible authority agency sets criteria for farmer selection. The project intended to use the selected farmer plots as a “farming practice example or role model” or pioneer areas to expand households in similar poverty conditions further. Furthermore, the successful Kok Nong Na model practice can be adopted as an alternative approach to rural development strategy at the national level.

1.8 Geography

The Countrywide project area covers 25,179 plots consisting of (1) Community Level Model (CLM) 337 plots and (2) Household Level Model (HLM) 24,842 plots. The project was implemented across the country with a budget of 4,787.9164 mil. baht covers 3,246 Tambon and 25,179 households.

1.9 Outputs

- 1) Creation of Job (temporary 1-year contract employment included)–Numbers of participants, create 9,188 local employments and household development of 34,367 persons, 24,842 “Role Model Households”)
- 2) Participating households receive necessary training and information for Kok Nong Na practices
- 3) Increasing number of farmland developed according to Kok Nong Na guidelines
- 4) Sustainable Communities – gaining essential and necessary “new” ways of farming and other agricultural practices as options to improve the quality of living.
- 5) Sustainable agriculture – possibilities of improved yield per farming area because of better allocation of farmland for more diversified activities, not necessarily increasing farming output.
- 6) Food security for households and communities – self-sufficient as participating households rely less on food from the market (increasing proportion of food cultivated from own farmland and hence, less expenditure on food purchase from markets)

1.10 Outcomes

- 1) Job/employment opportunity and income creation
- 2) Income creation and poverty reduction
- 3) Contribution to a better quality of environment such as increasing forest plantation areas according to Kok Nong Na practice for fresh air and retain carbon (improve air quality)
- 4) Creation of households and communities capable of facing financial and social challenges
- 5) Agriculture diversity and hence, income creation from various sources as risk diversification purpose
- 6) Self-sufficient and smoother income streams over time
- 7) Environmentally friendly agriculture; increasing use of non-chemical substance (fertilizer and pesticides in the farm land thus, reduce the chance if harmful health impacts to the household and community as a whole. Also, prevention of farmland quality deterioration)
- 8) Food security (Food self-sufficiency) and better long-term health as necessary nutrition can be cultivated within the farmland. Less expenses on health related for the household.

2. Project Site Visits:

Project Site	Date/Time	List of Informants
Phra Nakhon Si Ayutthaya Province	10 th Oct. 2022	1 HLM with the size of 3 rai (Male leader) – The plot was unsuccessful because the farmland was flooded after the land development stage in the KNN model. The area had no history of being flooded before the implementation of the project.
Phang Nga Province	21 th -22 th Oct. 2022	2 HLM both 1 rai households (one located in the city area of Phang Nga and the other is further out in the rural area) 6 local, provincial community development officers and local authorities responsible for the project
Nan Province	17 th – 18 st Oct. 2022	1 CLM with the size of 15 rai (Female leader) 1 HLM with the size of 3 rai (Couple) 10 local and provincial community development officers and local authorities responsible for the project
Loei Province	26 th -27 th Sept. 2022	1 CLM with the size of 15 rai (Male leader) 1 HLM with the size of 3 rai (Couple) 6 local and provincial community development officers and local authorities responsible for the project

3. Multi-Criteria Decision Analysis (MCDA)

3.1 The set of evaluation criteria for the KNN Project

The set of evaluation criteria emphasizes the project cycle process of project design, planning, and implementation as well as the output, outcome, and impacts on SCGs, NDCs, and BCG components to learn that the project has been well developed to achieve their goals and objectives and evaluate how it impacts on the sustainability and green recovery.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
3.1.1 Project Design					
1) Identifying project target group needs in setting objectives	<ul style="list-style-type: none"> - How was the project designed with its objectives? - Are there any forms of need analysis or supported information to set the project objectives? <p>* Identify the evidence showing the target groups' and stakeholders' involvement in project design and setting objectives.</p>	QL	<ul style="list-style-type: none"> 1- No evidence identifying procedure to define the project needs before setting the project objectives. 2- Mainly setting the objectives by using a top-down approach, slightly bottom-up to get the needs of the target group, 3- Mainly setting the objectives by using top-down, have some needs gathered from the target group 4- Mainly setting the objectives by a top- 	4	<ul style="list-style-type: none"> - The project and its objectives were initiated in response to a growing interest in Kok Nong Na (KNN) model practice as an application of the “New Theory Agriculture (NTA).” One of the drawbacks of the KNN model is that it requires some initial investment as the farmer needs to redesign the land for some designated utilization, i.e., to be used as water storage, for a variety of trees for different needs in the household, and for farmland used. The relatively heavy funding requirement presents a major obstacle, along with other hurdles to overcome, for farmers who were interested and willing to try it out. The project's main objective was to provide a group of farmers the necessary funding to get start with KNN model and used them as much more convincing examples and as learning centers to persuade some reluctant farmers to participate. Thus, the project was to create the “Community/Household Lab

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	In the case of using the bottom-up approach, identify the procedure showing the bottom-up approach to set objectives.		<p>down approach with needs gathered from all target groups and stakeholders</p> <p>5- Objectives are set by working together from top-down and bottom-up approaches.</p>		<p>Model (CLM and HLM) to improve quality of life, and this can be used as another alternative for rural development in Thailand.</p> <ul style="list-style-type: none"> - Local officers assigned to the project were responsible for collecting the list of farmers interested in participating and checking for all the requirements. The initial screening process was done at the provincial level, and the list of farmers was submitted for further consideration and budget allocation. For provinces with many farmers interested in the program, only some were selected by the Department of Community Development, Ministry of Interior. - The final decision on which farmer were selected relies on the community development department, as local officers mainly choose the farmer who best fits the criteria. The project's success depends on how well farmer plots were chosen and the important characteristics of the farmer were met. However, there was no reviewing process where there was a consultation session between local officers and authorities at the community development department. - Farmers selected to participate in the project are also subject to annual evaluation by local community development officer annually for the next 5 years.
2) Project rationality	- What is the project's rationale?	QL	1- No relation between the project's rationale	4	The project aims to improve resource management for year-round use, particularly land and water, which are essential for agriculture. Increasing cultivation diversity

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	<p>- Does the project rationale align with the SDGs and NDCs related to the project?</p>		<p>and the SDGs and NDCs</p> <p>2- Slightly related between the project's rationale and the SDGs and NDCs</p> <p>3- Moderately related</p> <p>4- Quite related</p> <p>5- Strongly related</p>		<p>allows the farmer to stabilize their income streams. Moreover, the KNN model also provided for expenditure reduction as self-reliant on food and the practice of using what is available in the farmland for farming supply, such as fertilizer, charcoal for heat and energy, non-chemical pesticide, etc., all of which is a circular economy manner. Thus, the KNN model practice was naturally related to the SDGs and NDCs as another approach to eliminating poverty, narrowing rural-urban development, reducing the income gap, and further developing the nation.</p> <p>The following were some of the implicit incidents from data collection (documents, interviews, and questionnaire) that were relevant to SDGs and NDCs:</p> <ol style="list-style-type: none"> 1) Increase the capacity of local communities to be more self-reliant (SDG10) 2) Improve water security and environmentally friendly agriculture (SDG6) 3) Sustainable resource development: water, soil, and forest (SDG6, SDG15) 4) Support the promotion of agricultural tourism (SDG8) 5) Reduce poverty and unemployment in local areas (SDG1, SDG8) 6) Encourage good health among Thai people (SDG3) 7) Increase economic competitiveness and better income distribution (SDG8, SDG10)

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
					8) Enhance well-being and happiness among Thai people and Thai society (SDG3)
3) Defining the target groups (criteria of selection)	<ul style="list-style-type: none"> - What are the criteria used to identify the project's target groups? - How well are the criteria developed? - Are the target groups appropriate in response to project objectives? - If any criteria, do the criteria ensure equity and inclusiveness? 	QL	<ul style="list-style-type: none"> 1- No criteria determined, and not able to identify if the target group is appropriate 2- Some criteria are hardly defined to ensure that the target groups are appropriate 3- Fairly clear criteria and moderately ensure that the target groups are appropriate 4- Quite clear criteria, and most target groups are appropriate. 5- Obvious criteria and all target groups are appropriate 	3	The criteria of participants' target groups were essential for the success of the KNN model project. Unfortunately, the requirements for farmer selection were not clearly stated during the project implementation process. Local community development officers were only informed to gather information about farmers interested in KNN, and the selection criteria focused on whether the farmer owns the land or has the right to utilize the land. Another critical factor, the characteristics of the farmer that fit with KNN practice, was not being prioritized enough. Hence, in some cases, farmers gave up and had to withdraw from the project.
4) Output/ Outcome/ Impact to SDGs and NDCs	<ul style="list-style-type: none"> - How do the outputs and outcomes of the project address the impacts on related SDGs and NDCs? 	QL	<ul style="list-style-type: none"> 1- No relation between the project's output/outcome and the impacts on SDGs, 	4	The outputs and outcomes of the KNN model for the quality of life improvement project implicitly addressed the impacts on related SDGs and NDCs as follows: <u>Environment</u>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	<ul style="list-style-type: none"> - Identify the SDGs and NDCs related to the project (i.e., Green Recovery, Environmental, Inequality reduction, and Inclusiveness. 		<p>NDCs, and BCG component</p> <p>2- Slightly related between the project's output/outcome and the impacts on SDGs, NDCs, and BCG component</p> <p>3- Moderately related</p> <p>4- Quite related</p> <p>5- Strongly related</p>		<ul style="list-style-type: none"> - SDG 2.4.1 (increase resilient agricultural practices that help maintain ecosystems) - SDG 6.4.2 (lower level of water stress) - SDG 13.2.2 and NDC (increase local forest area) - SDG 15.3.1 (restore degraded land and soil by integrated farming) <p><u>Economics</u></p> <ul style="list-style-type: none"> - SDG 2.1.1 (access to safe and nutritious food) - SDG 8.1.1 (increase household's annual income) - SDG 8.3.1 (decent job creation) <p><u>Social</u></p> <ul style="list-style-type: none"> - SDG 4.7.1 (Training to provide knowledge and skills that promote sustainable agriculture as well as opportunities to exchange and share products for the farmland and knowledge acquired) - SDG 5.5.2 (Increase the proportion of women in leading or managerial positions via the amount of time family spends together)
5) Defining the project risk management process	<ul style="list-style-type: none"> - Are there any concerns about risks related to the project during the project design process? - Are there any expected risks or obstacles that will make the project unsuccessful? 	QL	<p>1- None of the risks and obstacles are determined, and management</p> <p>2- Some risks or obstacles are determined but hardly defined and managed</p> <p>3- Some risks or obstacles are fairly</p>	3	Implementation of the KNN model project encountered several risk factors, resulting in twice the extension (delay) of the project. Some chosen farmers had to withdraw from the project because of not having clear ownership of the land (due to some change of mind by members of the family) or the right to use the land. The size and depth of the pond to be dug up for water storage (Nong) were calculated based on the soil type, geographical location, and how much rain or surface water is received yearly. This was to make sure that there was enough water for farming

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	<ul style="list-style-type: none"> - Is there any risk prevention or management integrated into project design? *If any, identify the risks and obstacles to the project's achievement and the risk management process 		<p>determined and managed</p> <p>4- Some risks or obstacles are well-determined and managed</p> <p>5- All risks and obstacles are well-defined and managed</p>		<p>year-round. However, there were cases where geographical conditions prevented farmers from getting the pond's depth, which is required by the model (blueprint). Adjustment to the shape and size of the pond was made using some required official procedures. In addition, some of the selected plots, located in the low-terrain or water-receiving area for flood prevention, were flooded. The condition, although it is not regular, was not well taken into account.</p>
3.1.2 Project Planning and Analysis					
6) The project's activity analysis	<ul style="list-style-type: none"> - What are the project activities? - Does the project activity cover the deliverables of the project's expected output/outcome? - How did SDGs and NDCs develop into activities or criteria to select counterparts in each activity? 	QL	<p>1- Not clearly defined project activities</p> <p>2- Slightly clearly defined the project activities but did not cover the expected outputs/outcome</p> <p>3- Somewhat clearly defined and cover the project output and outcome</p> <p>4- Clearly define and cover the project output/outcome related to the SDGs and NDCs.</p> <p>5- Very clearly defined and covered the</p>	4	<p>The project activities were well defined but were not fully implemented at the provincial level (activities 6 and 7 were not observed, or it was drawn some criticism of whether or not those two activities should be included at this stage of the development in the rural site. Seven activities of the project are as follows:</p> <ol style="list-style-type: none"> 1. Short up-skill training course on sufficiency economy agriculture development in Kok Nong Na model practice. 2. Build areas for community learning labs for quality of living development at Tambon and household level. 3. "Creating the trainer for development" Job creation for farmers, workers, newly graduated unemployed, especially return migrant workers 4. Stimulate local consumption via "เขามื้อสามัคคี" activity and support the necessary supplies for the training

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			project output/outcome related to the SDGs and NDCs.		<p>programs which were conducted on the KNN model plots.</p> <p>5. Coordinate integration of the development network.</p> <p>6. Develop “EarthSafe” organic agriculture product standard (Thai organic agriculture product standard) that covers product standards, product processing standards, and marketing of product standard</p> <p>7. Develop a digital platform to support local economy by building software systems and database systems</p> <p>Note: Because farmers who joined the project were under a 5-year contract to deliver as role models (a “lab model”) and KNN informants, they were subjected to an annual monitoring and assessment conducted by the local community development officers.</p> <p>The above activities cover all deliverables of the project's expected output/outcome and implicitly relate some SDGs and NDCs as stated in section 4) above.</p>
7) Involvement of target groups/ stakeholders in project planning and analysis.	<p>- Are the project’s target group and stakeholders involved in the project planning and analysis?</p> <p>If any, identify the activity</p>	QL	<p>1- No involvement</p> <p>2- Slightly involved and not cover all the target groups and stakeholders</p> <p>3- Moderately involved and not cover all the target groups and stakeholders</p> <p>4- Most of the target groups and</p>	4	<p>Information from interviews, questionnaires, and researcher observations showed that stakeholders in the project were actively involved in anticipation of achieving its objectives. Farmers who participated in the project recognized the benefits of the activities, especially the success plots. Local officers assigned to the project and those involved worked hard because the project requires much paperwork and collaboration across many official organizations and departments. Some of the drawbacks mentioned were the continuation of the project on 2 aspects: (1) for the project to succeed and serve the goals fully, it takes</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			<p>stakeholders are involved</p> <p>5- All of the target groups and stakeholders are involved.</p>		<p>time and courage for the participating farmers to enjoy the benefits of KNN model and the use that as an illustration of development practice, and (2) the training for DIRs was temporary hiring and there are also benefits to be gained with those already trained personnel to have an opportunity to remain in the area and use the skills for further development.</p>
8) The project's technical analysis	<ul style="list-style-type: none"> - What are the project's resource requirements? - Are the project's resources suitably related to the project's activities? - How were the project's resources obtained? 	QL	<ul style="list-style-type: none"> 1- No clearly define the project's resource requirements 2- Slightly clearly defined but not related to the project activities 3- Moderately clearly defined and partly related to the project activities 4- Quite clearly defined and mostly related to the project activities 5- Well-defined and all related to the project activities. 	4	<p>The KNN model had been accepted as a development model in Thailand prior to the implementation of the project under the rehabilitation loan fund. It was well documented that successful KNN model farmers were able to increase their quality of life. The blueprint for land design and utilization, as well as the set of knowledge necessary for the start of KNN model practice, was well documented. However, it required some initial investment, and specific characteristics of the farmers in the KNN model practice must be met. In most cases, the KNN model had been slow to spread out its impacts as an alternative to rural area-based development because farmers generally are not in the conditions to take the risk of switching from traditional to KNN model farming.</p>
9) The project's project organization & structure	<ul style="list-style-type: none"> - How was the project's team formed? - If any, define the procedure 	QL	<ul style="list-style-type: none"> 1- No clearly define the project's organization & structure 2- Slightly clearly defined but not related to the project activities 	4	<p>The KNN model project was implemented by the Community Development Department, Ministry of Interior, which had not been managing this type of project before. The project has been well managed as it fits with the common practice of the organization as an official unit for community development. The unit</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			3- Moderately clearly defined and partly related to the project activities 4- Quite clearly defined and mostly related to the project activities 5- Well-defined and all related to the project activities		has adequate and appropriate personnel and information about farmers locally. Some technical understanding of the KNN model practice might be lacking, as evidenced in the early stage of farmer selection to propose to the Community Development Department for final decision. The responsible authorities did a very good job coordinating and collaborating with other related offices, as required by the activities in the KNN model project.
10) The project's value-for-money analysis	Is there the project's value-for-money conducted? *Either qualitative or quantitative analysis is acceptable for evaluation.	QL	1. No analysis was conducted 2. Some analysis but hardly established result 3. Fairly conducted cost and benefit analysis, with positive results 4. Quite-well conducted cost and benefit analysis, with positive results in some dimensions (i.e., economic, social, and environmental) 5. Well-conducted cost and benefit study, both economic and financial analysis with positive	3	The project was based on successful experimental plots with well-conducted cost and benefit analysis. There were examples of farmers successfully transforming themselves from monocropping into diverse agriculture practices as a base for the KNN model. Specific quantitative analysis was complex to carry out due to the variety of plant selections as well as other agricultural activities in the farmland once the water pond was built and stored enough water for year-round use. Better utilization of farmland was observed with more cultivation of farm products rather than a one-time plantation of rice, maize, or other crops. However, some of the unsuccessful plots were also evidenced, especially when farmers faced some technical difficulties such as the pond was in the area where the type and quality of soil could not hold up enough water for year-round farming, the water pond could not be dug with enough depth or size to store the required amount of water to be used in the

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			results in all dimensions (economic, social, and environmental)		farmland, etc. Most of these technical and nontechnical problems led to farmers giving up too soon before the more extensive benefits of KNN model practice set in.
3.1.3 Project Implementation					
11) Produce the planned deliverables (percentage of achievement)	- Does the project achieve all the planned deliverables?	QT/ QL	1- None or Slight of the planned deliverables achieved (25% achievement or less) 2- Some of the planned deliverables were achieved (more than 25% achievement) but the 3- Most of the planned deliverables were achieved (more than 50% achievement), and some activity indicators met the target 4- Most of the planned deliverables were achieved (More than 75% achievement), and some activity indicators met the target	4	Most of the planned activities were achieved based on the project's implementation. The following are some of the deliverable experiences from the project: <ul style="list-style-type: none"> - Recruitment and selection of farmers and temporary hiring workers to be trained as DIRs - Training participating farmers and DIRs (100%, it is a must to participate in the project) - Dug reservoirs or water ponds (Nong) and established high-ground areas (Kok), which are used to plant a variety of trees and the areas for rice farming (Na) - Setting areas for meetings, exchanging knowledge, and training areas base (especially for CLM) in support of the KNN model practice. - Increase diversified plantation - Increase fishery factors - Support livestock - Support marketing of produces - Continuous communication and advisory services - Monitoring and assessment (100%) Note: A portion of the plots implemented in the project was ranked D from the assessment (about 10%)

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			5- All the planned deliverables were achieved, and all activity indicators met the target		
12) Implement the plan	<ul style="list-style-type: none"> - Does the project reach the target group? - Do all project activities reach all parts of the target group? - Are all project activities implemented as planned? 	QL	<ul style="list-style-type: none"> 1- Not meet the planned target group 2- Partly meet the planned target group, not achieve the target indicators 3- Mostly meet the planned target group and partly achieve the target indicators 4- Mostly meet the planned target group and achieve the target indicators 5- Well accomplished and reached all target indicators 	4	<p>The implementation of the project was successful as the number of plots met the plan, and it was distributed across all 77 provinces nationwide. Fewer CLMs were established than HLMs by design, as becoming CLM has much higher qualifications and is more difficult to meet. The project was able to reach out to the farmers who are very capable of being a role model and willing to transfer (teaching by doing) knowledge and practice with hand-on activities. There were also activities in which all participants in the project (farmers and DIRs included) got together on one select site (taking turns) and worked jointly to improve to firmly as if they were helping each other out. The provincial authorities supported such activities, and some budget was provided for the project. The activities also serve as a mechanism to stimulate the local economy via increasing local consumption and use of some of the agricultural products cultivated from their own KNN model farmland.</p> <p>Temporary hiring was also fully implemented for 12 12-month period. The jobs were opened for everyone, including those who lost their jobs and returned to their rural home. Two Job positions were created for</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
					each HLM plot and ten for each CLM plot, which helped mitigate some of the unemployment pressure during the COVID-19 pandemic.
13) Measure interim results attained	<ul style="list-style-type: none"> - Are participants and other key stakeholders satisfied with all aspects of the project? (Assess from the beneficiaries' perception) 	QL/ QT	<ul style="list-style-type: none"> 1- No assessment of beneficiaries' satisfaction 2- Project beneficiaries are slightly satisfied 3- Project beneficiaries are moderately satisfied 4- Project beneficiaries are quite highly satisfied 5- Project beneficiaries are highly satisfied 	4	Despite some of the obstacles involved in the project, such as problems related to digging the water pond and whether it is legal to build the pond at the depth required by the designed KNN model to the type of soil and whether the pond will be able to store water for later use in the year, the project has met the satisfaction of participants and stakeholders. The training program has been well appreciated by those who participated in the project. Most of them gained significant knowledge, beliefs, and trust in the KNN model practice, having confidence that it is the right approach for them to move forward. Local authorities also see the benefits farmers who joined the project achieved and are convinced to expand KNN model activities further.
14) Materials, information, and presentations are suitable for the target group	<ul style="list-style-type: none"> - How did the projects' materials and information present to the target group? - Are all materials, information, and presentations suitable for the target group? (Assess from the target groups' perception) 	QL	<ul style="list-style-type: none"> 1- No suitable and relevant at all 2- Hardly suitable and relevant 3- Fairly suitable and relevant 4- Quite suitable and relevant 5- Well-designed and communicated to the target group 	4	The project applied learning by approaching training with a well-designed model for the land utilization plans. Participated farmers have over 100 designs of KNN model to choose from with some flexibility for modification should there be some problem at the site. For instance, adjusting the pond's size, shape, and depth demanded collaboration across multiple government agencies for permission depending on the geographical location. The training has successfully changed farmers' attitudes and behavior from producing to earning income to producing for self-

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
					consumption first and for the market later. The project also provided information on non-chemical farming and planting trees that can be used on the farm, reducing farm production costs. Moreover, activities in the project also enhanced the opportunities to learn and share information, which proved to be very beneficial to all participating farmers and others.
15) The problems and obstacles in the project management process	<ul style="list-style-type: none"> - What are the problems and obstacles in project management? - If any, define the problem and problem-solving process 	QL	<ol style="list-style-type: none"> 1- None of the problems was solved 2- Slight problems were solved, and most still are obstacles to the project's achievement 3- Some problems are solved, and the project can proceed, but did not produce the expected outputs / produce the expected outputs but not sustained 4- Most problems are solved, and the project can proceed and produce the expected outputs 5- All problems are solved, and the project can proceed, 	4	<p>Major problems and obstacles in the project are listed as follows:</p> <ul style="list-style-type: none"> - The qualifications of the target farmer were rigid at the beginning due to the ownership of the land (there are cases where the farmer needs to get consensus from every family member before committing to the project) and the right to use the land. Local officers had difficulty finding enough farmers or suitable workers who were qualified as targeted, leading to modifications of various qualifications. - Farmers' problems with designed reservoir shapes and managing excavating soil within the plot area led to conflicts and dissatisfaction during the process. - Due to the COVID-19 pandemic, many activities had to be delayed or modified, and some needed to be done online, which is very difficult since the training requires hands-on learning by practice. - Due to raining season in many areas, pond-digging activities had to be postponed, and some areas had to be canceled. Hence, supporting production factors also had to be postponed accordingly.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			<p>produce the expected outputs, and monitor the process as a lesson learned for the future</p>		<p>Moreover, some plots were flooded in the year when water ponds were dug, which ruined the whole farming in the KNN model practice.</p> <ul style="list-style-type: none"> - Many of the participating farmers were discouraged, especially by family members and relatives who did not believe in the KNN model. They needed to be very patient over a certain period before a stable amount of income was generated. - No continuity. The project's one-year duration might not have yielded desirable results for agriculture. Soil improvement, fishery, plantations, and livestock all require continuity of support for at least 1-2 years to become fully self-reliant. - Local officers were key to the project's success. Unfortunately, they were all tied up with routine work, and this project added an extra load of work with limited time and various specifications. However, some of the local officers (provinces) were very much engaged in the project as they saw the benefits for the farmer and the KNN model as another approach they could adopt to their duties. Overall, the local officers coordinated well, working as a team while promptly seeking necessary advice from the responsible ministry when problems arose and trying to solve them as best they could. Therefore, most of the major problems were solved, and the project could proceed and produce some satisfactory expected outputs and outcomes.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
3.1.4 Overall Output evaluation: measures the immediate effect of the program and is aligned with the project objectives.					
16) Project's output	<ul style="list-style-type: none"> - How well has the project achieved its objectives (and sub-objectives)? - Identify the achieved outputs 	QT/ QL	<ul style="list-style-type: none"> 1- None of the output achieved 2- The project was partly achieved (less than 40% achievement) 3- The project was partly achieved (41%-60% achievement) 4- The project was mainly achieved (61%-80% achievement) 5- All objectives are achieved (more than 80% achievement) 	4	<p>Most of the project's objectives and outputs have been delivered, given the number of HLM and CLM plots implemented and the number of jobs created by hiring local workers to be trained as DIRs.</p> <ul style="list-style-type: none"> 1) Promote learning and adopt the KNN model as well as being learning sites in CLM and HLM nationwide for those who might be interested later on 2) Increase the water storage area for agriculture and develop land utilization and water management system with an environmentally friendly method 3) Enhance the capability of the agricultural sector to absorb the impacts of the COVID-19 pandemic and improve farmer's financial status both in income generation and income stability (reducing risk-taking behavior and potential indebtedness)
17) Achievement of project objectives	<ul style="list-style-type: none"> - Do all project objectives and indicators meet the targets? - Identify the indicators which meet the targets and do not meet the targets 	QT	<ul style="list-style-type: none"> 1- None or slight of the indicators meet the target (Less than 20% achievement) 2- 21%- 40% achievement 3- 41-60% achievement 4- 62-80% achievement 5- All indicators meet the targets (more than 80% achievement) 	4	The project meets all the targets set with more than 80% achievement.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
3.1.5 Outcome evaluation: concerned with the program's long-term effects and is generally used to measure the program goal. Consequently, outcome evaluation measures how well the program goal has been achieved.					
18) Measure the achievement of the overall goals	<ul style="list-style-type: none"> - Have the overall program goals been achieved? - Identify the goals that meet the targets and those that do not meet the targets. - Identify visible results or changes arising from the project 	QT	1- None or slight of the goals achieved (less than 20% achievement) 2- 21%-40% achievement 3- 41%– 60% achievement 4- 61%-80% achievement 5- All goals achieved (more than 80% achievement)	4	<p>The overall outcomes, as stated in the project document, have been successfully achieved as follows:</p> <ul style="list-style-type: none"> - Farmers have better quality of life - Farm products create value-added - Promoting environmentally friendly agriculture - Increase pride in the farming profession - More young farmers return to their hometown - Develop small farming agri-business - Continuing human resource development in the agricultural sector <p>However, to achieve the expected outcome as stated above, the continuity of project activities such as supporting knowledge and production factors is necessary. Although there were 5 years commitment between farmers and the Ministry, there was no further funding support in terms of budget allocation for the continuity of the project except some local offices that continuing provides supports for farmers under the project with their own fiscal budget.</p>
3.1.5 Specific Indicators (Project-based indicators)					
19) The impact of the project on achieving each Sustainable Development Goal (related to the project) each goal					
Environmental Impacts					
19.1) Increase of integrated	<ul style="list-style-type: none"> - The number of NTA farming areas 	QT	1- None of the impact on the goals/indicators 2- Slight impacts	4	<ul style="list-style-type: none"> - KNN model increased integrated sustainable farmland in CLM and HLM plots over various sizes ranging from 1 rai to 15 rai

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
sustainable farmland area	<p>increased under the project (in rai)</p> <ul style="list-style-type: none"> - Use of chemical substances such as chemical fertilizer or pesticide (before/after) 		<p>3- Moderate impacts</p> <p>4- High impacts</p> <p>5- Very high impacts</p>		- Farmers did not use chemicals in their KNN plot, so the use of chemicals in agricultural area
19.2) Level of water stress	<ul style="list-style-type: none"> - Number of water storage areas that increased under the project (in mil. m3) - Sufficiency of water usage for the whole year (consumption/agriculture) scale 1-10 / before - after 	QT	<p>1- None of the impact on the goals/indicators</p> <p>2- Slight impacts</p> <p>3- Moderate impacts</p> <p>4- High impacts</p> <p>5- Very high impacts</p>	5	The KNN model is about water management and storage for year-round usage, enhancing land utilization, and creating value. All participating farmers increased the number of water storage areas and enjoyed the benefits of having enough water for both consumption and farming purposes. CLMs, in most cases, were better managed and provided good quality water for consumption. For HLMs, the main focus of water storage was to use for farming purposes, which had more emphasis on getting enough water for year-round use. However, there were also cases in some geographical locations where water storage was difficult due to the type of soil that needed some modification and time in order for the pond to be able to hold up enough water. In such cases, the budget provided by the project might not be enough, and the participating farmers needed to obtain some additional funding, which, in some cases, was the cause of failed plots.
19.3) Increase local forest/trees area	<ul style="list-style-type: none"> - Numbers of planted trees during the year 2020 / estimation of 	QT	<p>1- None of the impact on the goals/indicators</p> <p>2- Slight impacts</p>	4	- Each KNN model plot grew at least 50 - 80 perennial trees. Relatively more trees were planted in the CLM plot than in the HLM plot. On average, one mature

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	CO ₂ absorption for next 10 years		3- Moderate impacts 4- High impacts 5- Very high impacts		perennial can absorb 9-15 kg of CO ₂ annually. Therefore, one NTA plot would absorb at least 450-1,200 kg of CO ₂ per year over the next 10 years.
19.4) Diversity plant based on household usages rather than mass production	<ul style="list-style-type: none"> - What types of trees/plants did farmers grow, comparing before/after participating in the project - Fill in by categories (economic trees, fruit trees, herbs, ground cover, ...) 	QT/Q L	<ul style="list-style-type: none"> 1- None of the impact on the goals⁹ /indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts 	4	<p>KNN model participants came from mixed backgrounds. There were those who returned from working in the urban area, mono-crop farming and had already started practicing the self-sufficiency economy philosophy (especially CLM) farmers. Prior to joining the KNN model project, farmers grew monocultures such as rice, sugar cane, cassava, corn, rubber, and longan (and some other fruits).</p> <ul style="list-style-type: none"> – After participating in the the KNN model project, farmers grew various plants based on the area context. <ul style="list-style-type: none"> ○ Fruit trees: Banana, Coconut, Guava, Durian, Avocado, Longan, Mango, Rambutan, Pomelo, Watermelon, etc. ○ Vegetables: Lemon, Chili, Lemongrass, Ginger Eggplant, Basil, etc. <p>Planting trees was also included as part of the KNN model for long-term use and charcoal production from small branches from the tree in circular economy practice.</p> <ul style="list-style-type: none"> – These diverse agricultures involve SDGs as follows: <ol style="list-style-type: none"> 1) Improve water security and environmentally friendly agriculture (SDG6) 2) Sustainable resource development: water, soil, and forest (SDG6, SDG15)

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
					3) Increase the capacity of local communities to be more self-reliant (SDG10) 4) Reduce poverty and unemployment in local area (SDG1, SDG8) 5) Encourage good health among Thai people (SDG3) 6) Enhance well-being and happiness among Thai people and Thai society (SDG3)
Economic Impacts					
19.5) Improve level of food self-sufficiency	Domestic food consumption (scale 1-10 / before – after - varieties of food consumption - satisfaction - Satisfaction from self-reliance farming technique	QT	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	4	Farmers participating in the KNN Model were found to be food self-sufficient as the practice leads them to grow what they eat and eat what they grow. Basic sources of nutrition come from the farm, such as eggs and fish for protein, rice from the field, and some livestock raised on the farm. Notice that most farmers' fish in the pond (Nong) will not be used to generate income but for food supply. Diversity farming, together with better utilization of farmland, allows farmers to become more food self-sufficient compared to most traditional Thai farmers who still rely on food from the local market because their vegetables and trees are not growing enough, particularly mono-crop farmers.
19.6) Increase household's annual income	- Number of jobs created - Income generation in the local area from local employment - Net return from farming activities	QT	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	4	- Based on the data received from interviews with (successful) farmers who participated in the project, mainly HLM, farmers are earning similar income from the KNN model compared to the previous income (Monocrop farming or monthly salary working in the nonfarm sector) in the first year. Farmers also expect income to rise in the following

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	(2021 comparing with 2020)				years to come as some of the trees planted start bearing fruits. In addition, other potential income is generated, such as fish in the pond and eggs from hens raised on the farm, which, in most cases, farmers do not sell but instead would like to keep on the farm for food security. Unfortunately, there are also some failed cases where the plot was abandoned, and farmers returned to work in the non-agriculture sector. There are also cases of participant farmers dying, and no one inherits the plot.
19.7) Number of farmers and workers participating in the project who were previously unemployed	<ul style="list-style-type: none"> - Are you unemployed before? - Are you migrating back due to covid 19? - If yes, do you plan to get back to work in the city or stay on the farm post covid? 	QT	<ul style="list-style-type: none"> 1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts 	4	<ul style="list-style-type: none"> - 25,179 KNN model plots were established, with 337 CLM plots and 24,842 HLM plots covering 3,246 Tambons. - 34,367 household development persons (trained) were created in the process - The KNN model project employed 9,188 temporary (12-month) workers to coordinate and assist farmers in both HLM and CLM plots - Most of the temporary hired to be trained as DIRs were newly graduated and unemployed prior to joining the KNN model project. - Most of the temporary workers hired for the project would like the project to continue for a longer period.
Social Impacts					
19.8) Training coursework provides knowledge and skills	<ul style="list-style-type: none"> - Number of farmers received NTA related 	QT/ QL	<ul style="list-style-type: none"> 1- None of the impact on the goals/indicators 2- Slight impacts 	4	<ul style="list-style-type: none"> - All participating farmers and DIRs required to attend 5-days 4-nights training program which cover for the fundamental understanding of KNN

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
that promote sustainable agriculture	<p>training under the project</p> <ul style="list-style-type: none"> - Training course syllabus (length / contents) - Usefulness / how to improve course syllabus) 		<p>3- Moderate impacts</p> <p>4- High impacts</p> <p>5- Very high impacts</p>		<p>model practice. The program helps fine tune farmers' farming attitude and lead to changing behavior. The program includes course such as</p> <ul style="list-style-type: none"> o Understanding Sufficiency Economy Philosophy and New Theory Agriculture (NTA) o Planning and designing KNN model o Practicing 9 learning bases such as self-producing fertilizer and plant hormone for various purposes, charcoal for energy and heat use within a household, how to protect and improve the soil quality in the farmland, Online Marketing and networking, etc. <p>The training was necessary for the project because one of the objectives is to use CLM and HLM and learning centers. Hence, the participating farmers needed to clearly understand the process of KNN model practice, using the learning-by-doing approach, and be able to teach (or transfer) knowledge to interested others. Moreover, the project also facilitated networking for the farmers to exchange and share their knowledge and, in many cases, use that as a consulting mechanism (providing expert opinions and being mentors) when facing new problems they cannot overcome.</p>
19.9) Proportion of women in leading/ managerial positions in implementing the project	<ul style="list-style-type: none"> - Numbers/proportion of farmers woman participating in the project woman 	QT / QL	<p>1- None of the impact on the goals/indicators</p> <p>2- Slight impacts</p> <p>3- Moderate impacts</p> <p>4- High impacts</p> <p>5- Very high impacts</p>	3	<p>There was no clear evidence of extinction for the role of females in KNN model practice. However, it was necessary to point out that most of the successful KNN model plots were running in family status as the couple helping out each other in the farmland activities. Some female leaderships were observed from the field study.</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	- Roles of woman in implementing the project example of an outstanding case				In one of the HLM sites visited by research, the wife took an initiation by resigning from a job at the factory, returning to the farmland, and later convincing the husband to join her. Making the decision to participate in the KNN model project when the local officer approached was from the female side as well. Thus, while it is unclear what role females take or how much influence they have to engage in KNN model practice, female farmers have a meaningful role to play, especially when trust needs to be gained from family members and neighbors.
3.1.6 Overall Impact Evaluation:					
20) Measure the project's overall impacts on the progress of SDGs Note: Evaluating from the <i>Specific Indicators</i> or project-level indicators.	- How well does the output/outcome of the project achieve the progress of the SDGs, NDCs, and BCG components?	QL	1- None of the output/outcomes achieving progress on the SDGs 2- Slightly achieving 3- Moderately achieving 4- Much achieving 5- A great deal in achieving	3	KNN model project was set to create a certain amount of practical example sites called "Community Lab Model" and "Household Lab Model" for quality of life. The number of plots covered relative to the size of the country is still small. The actual and significant impacts on SDGs, NDCs, and BCG components demand an expansion of the plots following the example of those CLM and HLM initiated by the project.
21) Measure the project's overall impacts on the progress of NDCs Note: Evaluating from the <i>Specific</i>	- How well does the output/outcome of the project achieve the progress of the SDGs, NDCs, and BCG components?	QL	1- None of the output/outcomes achieving progress on the NDCs 2- Slightly achieving 3- Moderately achieving 4- Much achieving	3	KNN model project was set to create certain amount of practical example sites called "Community Lab Model" and "Household Lab Model" for quality of life. The number of plots covered relative to the size of the country still small. The have actual and significant impacts on SDGs, NDCs, and BCG components demand

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
Indicators or project-level indicators.			5- A great deal in achieving		an expansion of the plots following the example of those CLM and HLM initiated by the project. For NDCs particularly, the KNN model project provides an alternative approach for area-based rural development, which supports NDCs in poverty reduction, narrowing inequality gaps, and promoting BCG components. KNN model practice promotes agricultural diversity in the farmland and eliminates the use of chemicals in farming. Circular economy was applied so that plants and trees grown on the farm were used for animal feeds, fertilizer, and other uses. The soil was better preserved, and more trees were planted on the farm, so the KNN model practices were considered more environmentally friendly and, hence, a green economy.
3.1.7 Sustainability: Continuity of the benefits and impacts. The extent to which the net benefits of the intervention continue or are likely to continue.					
22) The project's net benefits of the intervention continue or are likely to continue	- Will the outputs last?	QL	1- Absolutely not. 2- Maybe not 3- Not sure/unclear 4- Very likely 5- Definitely possible	3	As indicated by the first evaluation by the local officers (KNN models have been implemented for about 1 – 1.5 years), only about 34% of CLM and HLM plots were ranked in either A or B. More than 65% of the plots are still rated at C, mostly HLM plots. Those plots that were rated at A or B are expected to continue to be successful and fully realize the benefits of the KNN model practice as the process takes time to gradually improve the farmer's quality of living conditions. However, it was necessary and important to note that without the continuation of support, budget funding, and coordination service provided by the local

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
					authorities as the project discontinued, the progress toward the ultimate goal of sustainability was either harder or took a longer time to accomplish.
23) The project's flow of net benefits or the likelihood of net benefits continuing to deliver the outcomes and impacts over the medium and long term.	- Will the outcomes have the potential to deliver in the long term?	QL	1- Absolutely not. 2- Maybe not 3- Not sure/unclear 4- Very likely 5- Definitely possible	4	Over time, the KNN model plots that ranked A and B in the first evaluation were expected to progress and become fully functional learning centers that were going to attract interest from farmers who had not participated. Knowledge transfer is going to be on a larger scale and would be able to encourage more participants into KNN model practice. Moreover, some ranked C plots were expected to improve, especially those that joined later in the project. Knowing that the processes would take time to realize some of the benefits, it was anticipated that some of those ranked C plots would perform better in the next round of evaluation. 50% of the plots to be ranked in either A or B is highly possible. Together with some support (financially and technically), it would yield great benefits for the KNN model plots to pursue the goal of rural development and improve the quality of life as set in the project's objective.
3.1.8 Cost-Benefits Analysis on making project greener and more inclusive					
24) Estimate the benefit and cost to make the project greener or more inclusive	- Does the benefit outweigh the cost of making the project greener and more inclusive?	QL	1- Absolutely not. 2- Maybe not 3- Not sure/unclear 4- Very likely 5- Definitely possible	4	A post-analysis of the project's value-for-money covered various aspects. Economic impact - Increase the household income of farmers joining the project (100%) - Increase farm's net return for those joining the project (100%)

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
Note: Environment (greener) /social (inequality & gender) / economic (income generation & employment)					<ul style="list-style-type: none"> - Value adding in the economy 49%) Social Impact <ul style="list-style-type: none"> - Promote group integration - promote network building - Self-reliant community Environmental impact <ul style="list-style-type: none"> - Reduce chemical use in farming (83.61%) - Farming integrated activities (100%)

Remark:

* QT = Quantitative Indicators and QL = Qualitative Indicators.

3.2 Multi-Criteria Analysis (MCDA) and Discussion

3.2.1 MCDA's Results—KNN Model

Table II(a) MCDA's Results—KNN Model

Evaluation Criteria		Weight	Total Score	KNN
RELEVANCE/ COHERENCE	Project Design/Planning	20%	100	70.00
EFFICIENCY	Project Implementation	20%	100	80.00
EFFECTIVENESS	Overall Output / Outcome	20%	100	80.00
IMPACT	Impacts on SDGs and NDC	20%	100	78.75
SUSTAINABILITY	Continuity of the benefits and impacts	20%	100	70.00
OVERALL EVALUATION		100%	500	378.75

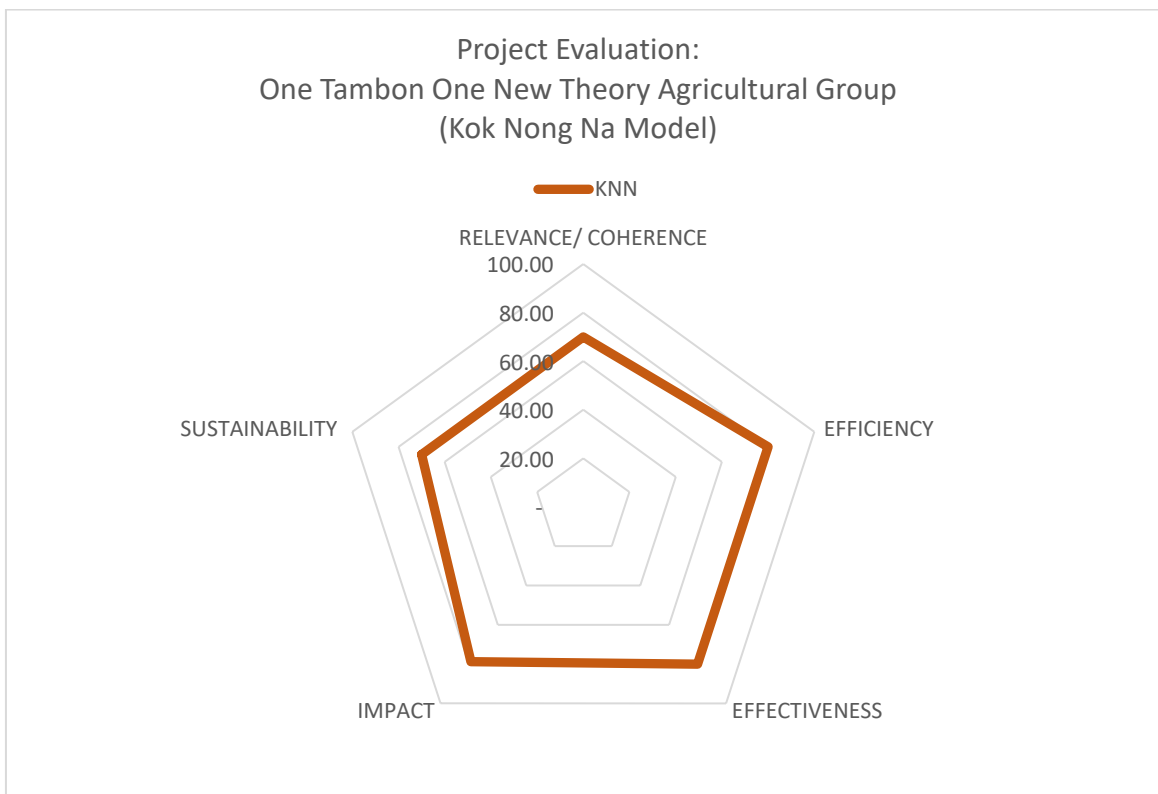


Figure II(a) Project Evaluation – KNN Model

3.2.2 Discussion

1) Relevance/Coherence

The KNN model implemented under the rehabilitation loan program differed slightly from the previous KNN model projects. The emphasis was on getting the participating poor farmers out of poverty or indebtedness and using the plots as a role model for KNN's good practices. Thus, the project was implemented with confidence that the KNN model farming practice can be successful based on some previous public and private experimental plots. Even though the KNN model practice has been demonstrated to have a good chance of improving farmers' quality of living, it has been slow in getting more farmers to participate and take the benefits. Some of the unsuccessful cases of the KNN model have also been noticed because certain factors were required for the farmer who practices the KNN model to achieve the goal. For instance, one of the necessary conditions for the KNN model identified earlier was that it requires an initial investment fund for land development to fit with the land design, which was also related to the utilization of land and resources in the farm. Specifically, part of the farm's area would need to be allocated for water storage so that farming activities and income generation can occur on a more stable and regular basis rather than relying on a lump sum income once a year at harvest. Digging the pond, however, demands a relatively large amount of funding, particularly for poor farmers who do not have enough savings. Farmers, then, are reluctant to borrow and take the risk of participating in the KNN model practice despite recognizing the possibility of success. It was also important to point out that the KNN model project under the rehabilitation loan program was not only designed to improve farmers' living conditions (getting out of poverty) but also to have the successful farmers become role models or mentors for other poor farmers. The financial support provided was for the potential farmers to overcome the initial obstacles in the KNN model practice. The farmers' plots would be used as "Lab Models" for learning and sharing experiences over 5-years period.

2) Efficiency

The practice of the KNN model has led to efficiency improvement in farm activities. Farmers could use their land more efficiently with diverse crops on the same farmland. Land and water, the two core essential elements in farming, were managed to utilize resources more efficiently. The evidence in the successful case suggests that farmers were able to either get themselves out of debt, generate more income, and, in many cases able to have more time available for their families. Efficiency at the project level indicated about half of the HLM and CLM developed as successful. The other half remained to see whether the KNN model practice conditions can be improved. Part of the failure plots experienced was caused by inappropriate selection, such as plots in the flooded area or a change in ownership (change of mind) to discontinue the KNN model practice. The farmers' commitment to the KNN model is crucial to the efficiency of the project because the processes take time to realize the benefits fully. Another aspect of the assessment was to consider from the perspective of project efficiency. Based on the number of plots implemented under the KNN model countrywide and some of the obstacles the responsible agencies had to overcome due to the nature of the project activities, the KNN

model project was assessed as quite efficient. The budget was used to create local employment and train the skills required for farmers and government officers involved in the project so that each party understood the roles they took to enhance the project's success. Despite the delay of project implementation for 6 months from the initial schedule, the selected plots were able to develop according to the KNN practices.

3) Effectiveness

Implementation of the project has successfully gotten over 25,000 plots of HLM and CLM across the country. The local community development officers identified the farmers who fit the criteria set in the project. Critical characteristics of farmers, besides ownership of the land, were looking for farmers who were quick learners and had hard-working attitudes. The effectiveness of the project was in two folds. One is to develop successful plots as role models along the way with some job creation and to have those plots as examples for expanding KNN model practice for rural development in Thailand. Employment served one of the project purposes as an economic impact mitigation measure. Over 9,000 jobs were created over the project implementation period, and those employed were trained and became much more knowledgeable in KNN model practices. Some employed workers eventually became interested in becoming a farmer in the KNN model practice, seeking opportunities to acquire land and all the necessary initial investment.

4) Impact

Potentially significant impacts on rural development can be expected from the KNN model project. Over 25,000 farmland plots were established and intended to develop into learning hubs with some initial investment. The immediate impact was for economic relief purposes, where almost 10,000 job positions were created, mostly for new graduates and returning workers to the rural area from jobs lost in the urban area. Poverty reduction and narrowing of the income inequality gap were anticipated based on how well the rate of successful plots measured the project performance. By the nature of the KNN model, greener and more inclusive community development can also be expected as farmers change their attitudes and behaviors in farming. Strengthening households and rural communities both socially and financially, together with creating environmental awareness in farming, serves as a solid foundation for improving the quality of life in the lacking rural areas in Thailand and, hence, enhancing opportunities for inclusive development.

5) Sustainability

“Farming Safety Net” was part of the sustainability aspect under the KNN model practice. The self-sufficient farmer was established in the initial stage of development as farmers were taught to self-reliance on their household consumptions (food and non-food such as animal feeds, fertilizer, and household use products). The approach was consistent with the circular economy, where farmers make use of what is available on the farm rather than relying on farming materials outside. Reduction of farm expenses puts less pressure on farmers to generate more income to cover the cost. Moreover, with greener practices

(no chemical use in farming) and more stable income, farmers enjoy better health and a better quality of living with more family time (couples are working together on the farm, and parents have more time to spend with their children).

Based on the field interviews, most of the participating farmers cited nonmonetary benefits such as time available to spend with family, better health and living conditions, and opportunities to share their knowledge and experiences to enhance other farmers, especially poor rural ones, so that they can have a better quality of life, as significant determination factors for them on deciding to join the project. This influential contribution was crucial, along with the participating farmers' success as mentors, leading to a longer-term sustainable development goal. Small farmers learned to be more self-sufficient and became less vulnerable to uncertainties and, hence, had a lower chance of getting into a debt trap. As more economic activities were created and spread out across the country, especially in rural areas, poverty reduction and income inequality could be gradually eliminated.

4 Project's Value for Money: Project Financial Analysis

4.1 Project's Benefits (Farmer streams of income)

The benefits of the KNN model project considered at the farm level include revenue generated in farming practices, various plants and trees, livestock, fish, etc. Different plants and trees on the farm generate various streams of income. Based on the interviews and questionnaires, a successful farmer can generate up to 50,000 baht a month in the first year (the amount indicated by a farmer who gave up their salary from working in an urban area) with more income expected in later years when trees start to bear fruit. The project helps improve the quality of farmland and allows for better utilization of land and water resources. Relative to the mono-crop plantation, the KNN model allows for a variety of trees to grow in the farmland, which supports the increase in forest area in Thailand. The KNN model practice also promotes the use of non-chemical fertilizers and pesticides to reduce toxic chemicals. Additionally, the KNN model project helps set up the KNN model farmers network as well as establish local hubs for learning and sharing knowledge and experiences.

4.2 Project's Costs

The costs associated with the project involve mainly salary expenses for hiring, training, land development, and support activities. For each of the HLM plots, about 66,000 baht was allocated for physical land development according to the KNN model design. About 20,000 baht for material supplies in supporting related activities was provided upon the approval of the responsible local officers. CLM were larger plots that received 185,000 baht for land preparation and about 40,000 baht in related activities as learning hubs. All of the budgets were allocated in the first fiscal year from the start of the project. Both HLM and CLM plots were committed to carrying on the activities for 5 years. It was not clear how much of the activities would be delivered as the budget dried out after the first year. Moreover, the training expenses were a significant proportion of the project as well. It has been crucial for the KNN model practice that participating farmers be well-trained and understand the practice. Some of the spillover benefits can also be considered for a given

set of assumptions. The KNN model is a “lab model” intended to create learning hubs and form farmer networking for knowledge and experience sharing. The communication network benefits farmers throughout the development steps as they might confront various farming problems and the possibility of getting access to new markets. Farmers in the KNN model were supposed to improve themselves by upgrading their farming skills and perhaps coming up with innovations in their practices, i.e., some farmers in certain areas had ideas of connecting the KNN farming model with the tourism sector.

At the farm level, besides the initial fund from the budget for setting up, there were some operating expenses related to farming operation activities. Those expenses were kept at a minimum by the farmers as they tried to use most of the farming materials within the farmland. In the first 3 years, farmers are not expected to have much of the expenses other than the cost of their own labor working on the farm, an opportunity cost of earning somewhere else outside the farm, or the foregone income from switching to the KNN model. Harvesting costs for plants and trees in the later years, when most of the trees start to bear fruits, would be considered in the calculation of future streams of net income.

4.3 Methodology

Value for money assessment at the farm level of the KNN model project was considered based on a financial model analysis. Financial feasibility in supporting farmers' decision to participate in the program was analyzed. The farmer's benefits were calculated from the expected income streams in all farm activities in various plants (short and long term) and vegetables. Several fisheries and farm animals were also considered depending on the farmer's decision among the available choices. The initial investment costs of KNN model farming include land development according to the KNN design, volunteer worker(s) allocated to the plot by the project hiring budget, and the funding for materials supporting the KNN model activities. The annual cost of farming and harvesting is calculated using the average cost data for each plant provided by the Ministry of Agriculture and Cooperatives. The data on the type of plants, farm animals, and fisheries and the quantity of each farming activity are collected from questionnaires and interviews with the farmers. Additional financial assumptions related to the assessment, such as the applied discount rate and the periods to be covered in the analysis, are provided to match with farming behaviors. Net Present Value, Internal Rate of Return, and the payback period are calculated to analyze the financial feasibility of the project at the farm level.

4.4 Assumptions for Estimation

Discount Rate. The discount rate applied in this analysis is at 6%. It reflects the cost of budgeting (shadow price of capital) and the alternative use of fund. The assumption is based on the government cost of borrowing at about 3% plus administration costs and in line with rate of return for the similar public investment project.

Expected Income. KNN model farmer's expected income is based farm productivity and price of the farming products. Productivity is assumed to follow the guideline of the information provided by the ministry of agriculture and cooperative which is the average of output per rai. Prices of the farm product are assumed to be an average price in the market. Perennial plants are assumed to bear fruit from year 3 to 7 in a gradually basis and reach its maturity level of output from year 7 on.

Expected Cost. The initial investment includes land development costs, hiring costs provided by the project, funding for material supporting KNN model activities from the project, and some contributions from the farmers. The cost of farming is also added based on the average cost of maintaining and harvesting the perennial plants over the years.

Project Duration. The study considers the project to last for a 10-year period for the analysis.

4.5 Results (NPV/ IRR/ Payback period)

Examining an HLM 3 rai, which can be considered a successful case of the KNN model project, indicates that farmers can benefit from the practice, especially in the long term. Table II(b) suggests that the farmer who participated in the KNN model is expected to have a positive value of NPV of about 720,000 over 10 years. The farmer is expected to have an initial investment of over 220,000 baht, which, in this case, the KNN model project provided for the selected farmer. In fact, this required investment is a significant barrier for small farmers, especially those poor and with limited access to funding, to practice the KNN model. It is also important to point out that, to be successful, the farmer must bear some cost of foregone income in the first couple of years before more income can be earned later. Uncertainty in the first couple of years of the KNN model is very important. It had been observed that some of the unsuccessful KNN model plots resulted from the plots being flooded or having some other difficulty so that farmers could not sustain long enough to gain the benefits in the later periods. The project's rate of return measured by IRR is 31%, which is above the 6% discount rate, demonstrating that the project provides a significant return to the farmer. The payback period of about 5 years shows that a farmer needs to remain in KNN model practice for at least 5 years to be sustainable.

**Table II(b) Project's Value for Money at the Farm Level
(KNN Household Lab Model 3 rai)**

Year	Net Cash Flows
0	-220,880.00
1	-81,969.16
2	12,726.93
3	72,434.85
4	90,207.10
5	145,501.17
6	143,155.17
7	235,059.20
8	236,273.57
9	321,208.23
10	382,532.26

NPV	720,121.51
IRR	31%
Payback Period	5 years 1 month
Discount Rate	6%

Source: Calculated by researchers

An income comparison for this KLM farmer shown in the following figure suggests that KNN model practice farmers can experience some expected foregone income in the first few years either from monthly salary given up or from part of the land use for water ponds and, thus, less farm cultivation. After 3 years, the expected income after KNN model practice is going to outweigh the previous earnings. It has been pointed out from the interviews that the first couple years of KNN model practice are difficult for farmers to go through. Farmers may be challenged by their neighbors and, in many cases, from within their family.

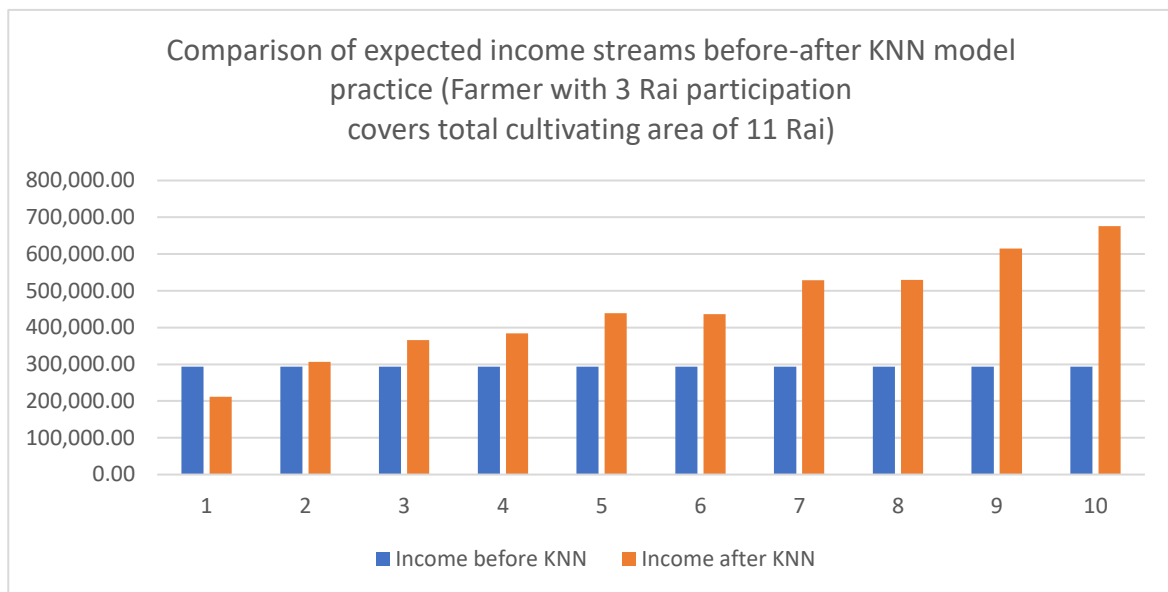


Figure II(b) Comparison of expected income streams before-after KNN model practice

The cost-benefit assessment of the KNN model project under the rehabilitation loan program largely depends on the rate of successful plots and the contributions those “lab models” have to rural development. The analysis needs to look over the course of the years as the KNN model takes time to evolve. Farmers will change their attitudes and, hence, their farming behaviors. Maximizing income generation from the farmland might not be the primary objective. Better utilization of resources, land, and water, in the farmland takes center stage in practice. Farming diversity and income stability over the long-term period are taken into account. In doing so, more trees and plants are grown in the same plots of land, and the quality of soil is maintained and improved because of the reduction or elimination of chemicals used in the farm. A household-size irrigation system was created to make enough water for year-round farming. Therefore, greener practices can be anticipated from the KNN model in the success cases compared to the mono-crop plantation: more trees, better farmland utilization, and improved soil quality. The learning hubs and farmers’ community networking are expected to contribute significantly to inclusive growth as the learning hubs attract more participation from farmers across the country. Unfortunately, a successful KNN model practice demands great commitment and patience from the farmer, which we see in many cases; farmers easily give up, and the plots become failures. Getting the right match of farmers and the required support needed play such a key role in KNN model contributions to greener and more inclusive development.

5 Project Overall Assessment and Lessons Learned

1.1 Strengths

Economic contributions. The project contributes significantly to the mitigation of negative economic impacts posed by the COVID-19 pandemic. Jobs are created for the local population and the returning unemployed from the urban area. An alternative diversity farming was introduced for those who are interested in switching from industrial workers to agriculture with fewer uncertainties and perhaps a better quality of life. The KNN model itself has already been established as an agricultural development alternative and is gradually being introduced to farmers, especially small and poor farmers who are most likely incapable of catching up with the rapidly changing economic conditions.

Farming cohesion and networking toward community development. The project adds to the critical component of rural development in collaboration among all agriculture stakeholders (farmers as producers, agriculture development officers, and the markets). Farmer networking was created through the activities in the project and the bonds between the responsible officers, not only the local community development who is responsible for project implementation but also other related departments that helped facilitate land improvement such as designing and building water ponds, providing hens and fishery for the farmer, and some material for producing nonchemical fertilizer. The relationship lasts for a longer time after the project is finished.

1.2 Drawbacks

Farmer and plot selection criteria. The analysis shows that farmer characteristics are crucial to the project's success. In the farmer selection process, the Department of Community Development set the major criteria, which has less information about farmers and land conditions in the local area. Some of the selected plots were unsuccessful due to many factors such as geographical unfitted area (there is no need to store water but rather a water management plan, but the project requires a pond to be dug up for water storage), unfitted farmers and technical issues such as the area might not be able to have the required size of pond to store enough water for yearly farming, or the pond itself might not be able to store water due to type of soil.

Up-down project design and implementation. Because of time limitations and the size of the project, the strict design of many features and activities was imposed a priori, together with the tight rule of budget reimbursement. As a result, it caused problems in the local area where the best-fit farmer might not be selected to join the program. The delay of the project in some areas and the unsuccessful plots were the results. For instance, the budget for land development was reimbursed based on the amount of soil dug out, which, in some areas, the pond cannot reach the depth planned for by the chosen design. The farmer has a pond that is too small to store enough water for year-round farming and, hence, cannot fulfill all the activities required by the KNN model.

6 Project-Based Recommendations

6.1 Project Cycle Process Including Project Design, Planning, and Implementation

The selection process for participating farmers, including the required criteria set and the ability of local officers to acquire the “right” farmers, are essential factors for the project's success. Criteria for farmer selection were set by the Department of Community Development, Ministry of Interior. Local community development officers have stuck to the criteria, selected farmers from voluntary applications, and appointed. Most of the criteria set were on the physical aspects of the project, such as the availability of ownership of the land or the right to use the land, farmers' willingness to learn and attend the necessary training program, etc. The number of farmers interested in the project vastly differs across provinces. Generally, there will be much more interest for farmers in the Northeastern area than those in the south. Therefore, the project's design might be better implemented in selected sites or areas based on how the KNN model's practice fits with the farmers' characteristics to improve the rate of success plots.

Allowing for some flexibility in decision-making for the local community development officer. They confront specific problems at the farm plot and collaborate with other government units to solve law- and regulations-related issues.

Criteria for farm selection in KNN model practice have been a crucial success factor. Volunteer farmers with matching characteristics and attitudes for diverse farming might be identified targets for the project's expansion into further rural areas where information and assistants are challenging to access. A more aggressive approach for less-opportunity farmers who desperately need help getting themselves more self-sufficient and out of poverty would be a great advantage of the KNN model. Strengthening community gathering and farmer network extension can also be the next step toward farm development, particularly for greater market access.

6.2 Project Outputs, Outcomes, and Impacts on SDGs, NDCs, and BCG Component

Continuation of the project is essential to the achievements of the project, especially on the sustainability aspect both in terms of output measured in the number of successful plots and hands-on learning (also exchange of farming knowledge and experiences) center/unit and outcome in poverty elimination and rural development.

The capacity-building initiation of the KNN model project contributes significantly to developing more efficient farming skills. It expands opportunity choices for farming practices, which, in the long run, could lead to farming innovation and alternative ways of rural development.

Collaboration networks among farmers, within and across communities, benefit farmers by sharing information and facilitating market access in the late stages of development.

III. Project Evaluation Report: Development of pilot areas for the travel safety zone

1. Project Background/Attributes

1.1 Project Background:

The government approved a Safety Zone campaign promoting safe tourism attractions in preparation for tourists' return after the pandemic. The Ministry of Tourism and Sports (MOTS) launched a Safety Zone seminar to prepare tourism businesses for the country's future reopening to international and local tourists once the COVID-19 situation has de-escalated. The safety zone required good management to make tourists feel safe and fairly treated. The Department of Tourism had nominated five tourism areas nationwide to pilot this campaign.

There were five attractions. Bang Saen beach, in Chon Buri. The Beach represented a natural tourism area. Nan Old Town, in Nan province, was a pilot area that reflected urban tourism. Baan Rai Kong Khing Community in Chiang Mai represented a community-based tourism area. Yaowarat neighborhood in Bangkok represented the shopping district. Moreover, the Asiatique riverfront by Chao Phraya River in Bangkok was a model of manufactured attraction.

Safety, health, and fairness were the three main principles of the Safety Zone campaign to ensure the health and safety of visitors. The attractions participating in this campaign must have a risk management plan to handle emergencies or unexpected situations.

Vendors in the area, surrounding communities, and related agencies got training in the New Normal way of tourist services. Practices developed in these five pilot areas would later be reviewed and used as models for other tourism areas in Thailand.

1.2 Responsible Agency:

Ministry of Tourism and Sports: Department of Tourism

1.3 Descriptions:

Thai government policy used the promotion of the tourism industry to promote and drive Thailand's economy and a primary source of foreign exchange. However, the COVID-19 pandemic has forestalled the Thai economy and social sector, especially the tourism industry. However, if COVID-19 had improved, the tourism industry needed to prepare and adjust for the future arrivals of international and local tourists. This opportunity and the boost of tourism would help the Thai government focus on the tourism sector for tourists and entrepreneurs. The Thai government provided a relief package to reduce the negative impact of COVID-19. On the tourist side, the Thai government focused on the safety of those traveling to Thailand. The new development concept was "New Normal tourism." The tourism services industry encompassed quality

tourism with high safety, hygiene, and health standards. Thus, under the Ministry of Tourism and Sport, the Department of Tourism set up a vision for tourism promotion that stresses tourist safety regarding the quality of services, infrastructure, convenience, and management. Thus, to further the Thai tourism image and boost tourists' confidence, the Department proposed the "Safety Zone" project. There were five attractions Bang Saen Beach in Chon Buri, nominated as a model natural tourism area; Nan Old Town in Nan as a model urban tourism area; Baan Rai Kong Khing Community in Chiang Mai as a model community-based tourism area; Yaowarat neighborhood in Bangkok as a model shopping district, and Asiatique the Riverfront by Chao Phraya River in Bangkok as a model man-made attraction.

Safety, health, and fairness were the three main principles of the Safety Zone campaign to ensure the health and safety of visitors. The attractions participating in this campaign would have a risk management plan to handle emergencies or unexpected situations. Vendors in the area, surrounding communities, and related agencies got training in the New Normal way of tourist services. Practices developed in these five pilot areas would later be reviewed and used as models for other tourism areas in the country.

1.4 Project Status (as of 31st December 2021)

Project completed in June 2021

Total approved budgets: 15 million baht

Total used budgets: 15 million baht (100%)

1.5 Project Objectives

- Develop the management role model for secured tourism areas for tourist safety.
- Develop a knowledge body regarding hygiene and safety for tourism enterprises and communities
- Promote travel safety zones to both Thai and foreign tourists
- Build tourists' confidence.

1.6 Project Target Group

Vendors in the area, the surrounding communities, tourists, and related agencies

1.7 Project Goals

- Develop five pilot travel safety zones
- Train 500 tourism enterprises.
- Develop safety and sanitation standards for each type of tourist destination.

1.8 Project Activities

- Develop the management role model for secured tourism areas for tourist safety.

- Develop a knowledge body regarding hygiene and safety for tourism enterprises and communities
- Promote travel safety zones to both Thai and foreign tourists
- Build tourists' confidence.

1.9 Geography

- Ban Saen Beach in Chon Buri (a model natural tourism area)
- Nan Old Town in Nan (a model of an urban tourism area)
- Baan Rai Kong Khing Community in Chiang Mai (a model of a community-based tourism area)
- Yaowarat neighborhood in Bangkok (a model shopping district), and
- Asiatique the Riverfront by Chao Phraya River in Bangkok (a model of man-made attraction)

1.10 Outputs:

From the interview with executives from the Department of Tourism, the project had no budget for ex-post project evaluation by the external auditor. However, the Department, local municipalities, and enterprises had developed five travel safety zones as planned. They had trained more than 500 vendors and enterprises. The number of trained enterprises was above the project goals. Also, they set up handbooks for safety and sanitation standards for each project site.

1.11 Outcomes:

The travel safety zone project had four intended outcomes. Thus, the consulting team interviewed a Ministry of Tourism and Sports representative and found the following achievements.

1) Thailand had pilot safety zones that could be adopted and extended by other tourism sites.

"From interviews with local and ministry officers, they would get a budget from other sources to extend the project's success to other tourist spots. These spots were either within the same areas or in the other provinces."

2) Both local communities and vendors have improved tourism services and sanitation standards so that the community can earn more income throughout the grassroots value chain.

"From interviews with participating vendors and local communities, the project had set up better standards for safety, sanitation, and fair treatment. However, due to the recurring Covid outbreak and government lockdown, the project did not yield higher income gain during the project life span. The local communities hoped it would be better after the change of Covid from epidemic to endemic in October."

3) Tourists would have more confidence regarding fairness and safety when traveling to the project sites.

"From the interview and questionnaire survey, Tourists would have more confidence in traveling to the safety zone of Bang Saen and Nan. However, the effect was not immediate since there was no tourists since the lockdown of both Nan province and Bang Saen during the safety zone training."

2. Project Sites

2.1 The rationale for project Site Selection for Evaluation

Given the limited budget and resources, the consultant team conducted preliminary interviews with executives from the Department of Tourism and Asiatic the Riverfront. After careful consideration, two sites were used for project evaluation: Nan Old Town and Chonburi. The Nan Old Town was the best representative of the local tourism area, where it aimed to preserve the old traditional way of life and welcome global tourism. The Old Town projects covered cultural tourism and stressed preserving natural resources. In addition, there were many related stakeholders, including corporates, community enterprises, farmers, and locals. Chonburi, Bang Saen Beach, best represented the culmination of the modern seaside with global vibes and the local street foods market. It aimed to be one of the top local destinations for international and local tourists. Therefore, it enhanced tourism competitiveness, generated more income, and covered many stakeholders, from conglomerates to local street vendors. Hence, Bang Saen could showcase the recovery and organic growth of the Thai tourism industry. Both Bang Saen Beach and Nan Old Town were under the jurisdiction of local municipalities or Thesaban Mueang.

Bang Saen Beach was approximately 14 kilometers from Amphoe Muang, Chon Buri. Moreover, it was a top-rated beach because it is closest to Bangkok and near Pattaya, a world-class attraction. Visitors could take Sukhumvit Road, turn right at km.104, and continue for 3 kilometers. The Beach was a popular tourist attraction for Thai people. Also, it was the most famous Beach for locals and foreign workers who loved to flock here every weekend to swim and enjoy beach activities. Thousands of deck chairs and a hundred local street food vendors dotted the 4.5-kilometer stretch beach. Visitors could enjoy the Beach by riding bicycles from rental shops nearby.

Nan is a charming mountainous province that captivates many visitors and keeps them returning for its tranquility and hospitable residents. Although many of its famous natural attractions lie in remote areas, Nan town's old quarter is also famous and easy to get around by walk or bicycle. Throughout the day, visitors have a memorable time visiting beautiful temples and taking photos in this cycling-friendly town.

Nan Old Town was undoubtedly like an abode for temples. The temples of Nan had so much more to offer. The architecture, the exquisite ancient Thai art, the culture, and the lifestyle of the monks provided fond memories for travelers.

The perfect travel area was incomplete without a night spent in the local markets. Nan Walking Street shone brightly at night, with a busy street in the day filled with shops

and stalls turning into an attractive night market. Handicraft shops selling local produce from indigenous people made for a fulfilling shopping spree. The night street market is in front of Wat Phumin, one of the most beautiful temples in the middle of the Nan Old Town.

2.2 Project Site Visits and Data Collection.

The list of the site visit and timestamps are in the following table. The interview questions and questionnaire were conducted using both qualitative and quantitative cost-benefit analysis. The qualitative questions were in line with OECD principles and Cost-Benefit Analysis techniques. Moreover, the questionnaire developed a cost-benefit analysis of the nonmarket valuation for travel safety zones. The questionnaire represented the methodology of the travel costs model under the Random Utility assumption. The questionnaire result was pivotal to calculating the unconditional mean of willingness to pay necessary in estimating the project's value for money.

Project Site	Date/Time	List of Informants
Province/ District/ Subdistrict Bangkok	31 May 2022 Time 13.30 – 14.45 hrs / Zoom	– Project Beneficiaries – Local Authorities responded to the project Representatives from responsible agencies, the Department of Tourism, Ministry of Tourism and Sports Interviewed four Managers and Officers from the Department of Tourism
– Man-made pilot area		
Bangkok Asiatique the Riverfront Charoenkrung Road, Wat Phraya Krai, Bang Kho Laem, Bangkok 10120, Thailand	1 June 2022 Time 15.00 – 15.45 hrs/zoom	General Manager at ASIATIQUE The Riverfront. Interview of Asiatique Management Teams.
- Nan Province; Nan Old Town in Nan (a model of urban tourism area)		
Nan Municipality,	1 st meeting on 6 July 2022 Time 09.30-10.30 hrs. / Zoom	Relevant government agencies' key person. Nan municipalities Director.
Nan Municipality Office, Muang District, Nan Province.	2 nd meeting on 23 rd August 2022 Time 13.00- 16.00 hrs.	Management and Extension Team: Three officers.
Old Town Community, Nan Province	24-25 th August 2022 Time 0900-16.30 hrs.	Old Town Operators Mueang Nan (e.g., restaurants, accommodations, souvenir shops, tram services, etc.) Interview of 11 enterprises.

Project Site	Date/Time	List of Informants
	Old town	
Walking Street, Old Town Community, Nan Province.	1 st meeting on 26-27 th August 2022 2 nd meeting on 1-30 th September 2022	Stakeholders: Tourists, Local Residents, Others Interview of 18 Tourists. On-site questionnaire survey of 200 tourists.
– Chonburi province; Natural tourism area		
Saensuk Municipality	1 st round 1 st September 2022 14.00-15.30 hrs. / Zoom	Management Team Relevant government agencies' key person.
Bangsaen Beach Tambon (subdistrict) Saen Suk, Mueang Chonburi district, Chonburi province,	1 st round 9 th September 2022 13.00-17.00 hrs.	Entrepreneurs in the areas; (e.g., restaurants, merchandising shops) Interview of 10 enterprises.
Saensuk Municipality Office, Bang Saen Sai 2 Rd., Saen Suk, Mueang, Chonburi Province	2 nd round 15 th September 2022 13.30-15.30 hrs.	Management and Extension Team: Interview of eight officers.
Project Site at Bang Saen Beach	1-30 th Sep 2022	Stakeholders (Tourists) On-site questionnaire survey of 200 tourists.

3. Multi-Criteria Decision Analysis (MCDA)

3.1 The set of evaluation criteria and scores for the selected projects.

The set of evaluation criteria emphasized the project cycle process of project design, planning, and implementation as well as the output, outcome, and impacts on SCGs, NDCs, and BCG components to learn that the project had been well developed to achieve their goals and objectives and evaluate how it impacted on the sustainability and green recovery.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
3.1 Project Design					
1) Identifying project target group needs in setting objectives	<ul style="list-style-type: none"> - How was the project designed with its objectives? - Are there any forms of need analysis or supported information to set the project objectives? <p>* Identifying the evidence showing the target groups' and stakeholders' involvement in project design and setting its objectives.</p> <p>In the case of using the bottom-up approach,</p>	QL	<ul style="list-style-type: none"> 1- No evidence identifying procedure to define the project needs before setting the project objectives. 2- Mainly setting the objectives by using a top-down approach, slightly bottom-up to get the needs of the target group, 3- Mainly setting the objectives by using top-down, have some needs gathered from the target group 4- Mainly setting the objectives by a top-down approach with 	4	<p>The Department of Tourism initiated the project in response to the Covid-19 outbreak. It used the connection with the local authority and government to determine their needs for training to improve the stakeholder knowledge and capability in providing better tourism services and enhancing the travel communities' sustainability.</p> <p>The top-down approach benefited significantly from the continuous relationship between local municipalities and the Department of Tourism since they form a long-term partnership in developing the local tourism industry. Therefore, the project objectives and setting process were in sync with the local need and based on previous project experience.</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	identify the procedure showing the bottom-up approach to set objectives.		needs gathered from all target groups and stakeholders 5- Objectives are set via working together from top-down and bottom-up approach.		
2) Project rationality	<ul style="list-style-type: none"> - What is the project's rationale? - Does the project rationale align with the SDGs and NDCs related to the project? 	QL	<ul style="list-style-type: none"> 1- No relation between the project's rationale and the SDGs and NDCs 2- Slightly related between the project's rationale and the SDGs and NDCs 3- Moderately related 4- Quite related 5- Strongly related 	3	<p>The project was aligned with SDGs on creating jobs, promoting economic growth, sanitation, and sustainable communities. However, it was not related to NDCs.</p> <p>The project's document stated impacts from the project which are implicitly relevant to SDGs and NDCs as follows:</p> <ul style="list-style-type: none"> 1) Create more income and Jobs (SDG 8) 2) Sanitation (SDG 6) 3) Sustainable Community (SDG 11)
3) Defining the target groups (criteria of selection)	<ul style="list-style-type: none"> - What are the criteria used to identify the project's target groups? - How well are the criteria developed? - Are the target groups appropriate in response to project objectives? 	QL	<ul style="list-style-type: none"> 1- No criteria determined, and not able to identify if the target group is appropriate 2- Some criteria are hardly defined to ensure that the target groups are appropriate 3- Fairly clear criteria and moderately ensure that 	3	<p>The selection criteria for the target group and stakeholders focused on the possibility of being the pilot project for the travel safety zone. Thus, it covered the sites that had worked with the Department of Tourism to develop better tourism services. In addition, the sites covered the complete classification of Thai tourism sites. Moreover, the target groups were appropriate since they were both small and large enterprises that were important in the Thai tourism value chain.</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	- If any criteria, is the criteria ensure equity and inclusiveness?		<p>the target groups are appropriate</p> <p>4- Quite clear criteria, and most target groups are appropriate.</p> <p>5- Strongly clear criteria and all target groups are appropriate</p>		Since the selection criteria feature an exhaustive list of enterprises, thus there would be no issue related to equity and inclusiveness. However, receiving the project's information would be relatively challenging for new entrepreneurs.
4) Output/ Outcome/ Impact to SDGs and NDCs	<p>- How do the outputs and outcomes of the project address the impacts on related SDGs and NDCs?</p> <p>- Identify the SDGs and NDCs related to the project (i.e., Green Recovery, Environmental, Inequality reduction, and Inclusiveness.</p>	QL	<p>1- No relation between the project's output/outcome and the impacts on SDGs, NDCs, and BCG component</p> <p>2- Slightly related between the project's output/outcome and the impacts on SDGs, NDCs, and BCG component</p> <p>3- Moderately related</p> <p>4- Quite related</p> <p>5- Strongly related</p>	4	<p>The expected output, outcomes, and impacts addressed the SDGs quite well, focusing only on economic impact but indirectly affecting the environment and social outcome. However, no goals related to NDCs were included. The project only had SDGs related to green recovery.</p> <p><u>Environment (Indirect)</u> Better waste management and sanitation (SDG 6.2.1) helped the environment by reducing plastic usage, alcohol use, and the use of soap stations for hand washing.</p> <p><u>Economic</u> SDG 8.1.1 (increase household's annual income) SDG 8.3.1 (decent job creation)</p> <p><u>Social (Indirect)</u></p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
					It improved inequality by covering the extensive list of small and large food vendors. Moreover, the project outputs stressed the sustainability of communities in further developing safety travel zone (SDG 11.a.1)
5) Defining the project risk management process	<ul style="list-style-type: none"> - Is there any concern about risks related to the project in the project design process? - Are there any expected risks or obstacles that will make the project unsuccessful? - Is there any risk prevention or management integrated into project design? <p>*If any, identify the risk and obstacles to the project's achievement and the risk management process</p>	QL	<ul style="list-style-type: none"> 1- None of the risks and obstacles are determined, and management 2- Some risks or obstacles are determined but hardly defined and managed 3- Some risks or obstacles are fairly determined and managed 4- Some risks or obstacles are well-determined and managed 5- All risks and obstacles are well-defined and managed 	3	The project design had few risk concerns since it focused on training and evaluation of travel sites. There was no expected risk, only a moderate number of participants since Covid. However, the project dealt with the moderate numbers of on-site participants through recurring Covid outbreaks and government Covid measures by adopting technology such as online meetings and improving sanitation standards of the venue. Thus, the number of participants turned out to be higher than expected.
3.2 Project Planning and Analysis					

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
6) The project's activity analysis	<ul style="list-style-type: none"> - What are the project activities? - Does the project activity cover the deliverables of the project's expected output/outcome? - How did SDGs and NDCs develop into activities or criteria to select counterparts in each activity? 	QL	<ul style="list-style-type: none"> 1- Not clearly defined the project activities 2- Slightly clearly defined the project activities but did not cover the expected outputs/outcome 3- Somewhat clearly defined and cover the project output and outcome 4- Clearly define and cover the project output/outcome and related to the SDGs and NDCs. 5- Very clearly defined define and cover the project output/outcome and related to the SDGs and NDCs. 	3	The project activities were clearly defined. However, they were not explicitly related to SDGs and NDCs. The activities covered the measurable deliverables as well as expected output and outcomes. However, SDGs and NDCs had no role in selecting activities and counterparts for each activity. Each selected activity and counterpart were helping in the recovery of Thailand tourism in each location; thus, it achieved the SDGs as a byproduct of the increase in revenue and sustainable tourism practice.
7) Involvement of target groups/stakeholders in project planning and analysis.	<ul style="list-style-type: none"> - Are the project's target group and stakeholders involved in the project planning and analysis? 		<ul style="list-style-type: none"> 1- No involvement 2- Slightly involved and not cover all the target groups and stakeholders 	2	The target groups and stakeholders shared their appropriate schedule for training with the municipalities and the Department of Tourism.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	If any, identify the activity		3- Moderately involved and not cover all the target groups and stakeholders 4- Most of the target groups and stakeholders are involved 5- All of the target groups and stakeholders are involved.		
8) The project's technical analysis	<ul style="list-style-type: none"> - What are the project's resource requirements? - Are the project's resources suitably related to the project's activities? - How were the project's resources obtained? 	QL	1- No clearly define the project's resource requirements 2- Slightly clearly defined but not related to the project activities 3- Moderately clearly defined and partly related to the project activities 4- Quite clearly defined and mostly related to the project activities 5- Well-defined and all related to the project activities.	5	The project needed staffing from both municipalities and the Department of Tourism. With well-planned activities, the resources were suitable and sufficient to execute the training. The projects carried on at the determined venues with solid linkage with the local municipalities, either hotel or municipalities meeting hall.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
9) The project's project organization & structure	- How was the project's team formed? If any, define the procedure.	QL	1- No clearly define the project's organization & structure 2- Slightly clearly defined but not related to the project activities 3- Moderately clearly defined and partly related to the project activities 4- Quite clearly defined and mostly related to the project activities 5- Well-defined and all related to the project activities.	5	The project team came from the Department of Tourism expert and capable municipalities' staff. The municipalities' staff were more than capable of dealing with training and checkups for travel site improvement since these activities were embedded in their routine activities. Thus, only additional hours of work and care by these dedicated staff helped improve the project organization and structure.
10. The project's value-for-money analysis	- Is there the project's value-for-money conducted? *Either qualitative or quantitative analysis is acceptable for evaluation.	QL	1- No analysis was conducted 2- Some analysis but hardly established result 3- Fairly conducted cost and benefit analysis, with positive results 4- Quite-well conducted cost and benefit analysis, with positive results in some	1	There was no value to money evaluation since a small project budget of 15 million baht.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			dimensions (i.e., economic, social, and environmental) 5- Well-conducted cost and benefit study, both economic and financial analysis with positive results in all dimension (economic, social and environmental)		
3.3 Project Implementation					
11. Produce the planned deliverables (percentage of achievement)	- Does the project achieve all the planned deliverables?	QL	1- None or Slight of the planned deliverables achieved (25% achievement or less) 2- Some of the planned deliverables were achieved (more than 25% achievement) but the 3- Most of the planned deliverables were achieved (more than 50% achievement), and some activity indicators met the target 4- Most of the planned deliverables were	4	The project exceeded the defined deliverables in all the zones and stakeholders, except only for restroom and toilet improvement training in Bang Saen. The toilet and bathroom in Bang Saen were not only under the different government agencies' jurisdiction but also had to be closed during the time of activities since the government Covid mandate.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			<p>achieved (More than 75% achievement), and some activity indicators met the target</p> <p>5- All of the planned deliverables were achieved, and all activity indicators met the target</p>		
12) Implement the plan	<ul style="list-style-type: none"> - Does the project reach the target group? - Do all project activities reach all parts of the target group? - Are all project activities implemented as planned? 	QL	<p>1- Not meet the planned target group</p> <p>2- Partly meet the planned target group, not achieve the target indicators</p> <p>3- Mostly meet the planned target group and partly achieve the target indicators</p> <p>4- Mostly meet the planned target group and achieve the target indicators</p> <p>5- Well accomplished and reached all target indicators</p>	4	The project reached almost all the targeted groups, except the toilet and bathroom improvement in Bang Saen.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
13) Measure interim results attained	<ul style="list-style-type: none"> - Are participants and other key stakeholders satisfied with all aspects of the project? <p>(Assess from the beneficiaries' perception)</p>	QL	<ul style="list-style-type: none"> 1- No assessment of beneficiaries' satisfaction 2- Project beneficiaries are slightly satisfied 3- Project beneficiaries are moderately satisfied 4- Project beneficiaries are quite highly satisfied 5- Project beneficiaries are highly satisfied 	5	The participants were highly satisfied with the training. The municipalities and the Department of Tourism conducted an interim survey along with a satisfaction survey at the end of training or after giving out the Travel Safety Zone certificate. The results showed a high satisfaction level of participants. Moreover, the consultants' survey found that both Nan and Bang Saen participants had highly rated average satisfaction scores of 9 out of 10.
14) Materials, information, and presentations are suitable for the target group	<ul style="list-style-type: none"> o How did the projects' materials and information present to the target group? o Are all materials, information, and presentations suitable for the target group? <p>(Assess from the target groups' perception)</p>	QL	<ul style="list-style-type: none"> 1- No suitable and relevant at all 2- Hardly suitable and relevant 3- Fairly suitable and relevant 4- Quite suitable and relevant 5- Well-designed and communicated to the target group 	5	The physical and electronic information packages were relevant for the practices of both small and large enterprises, ranging from food preparation, COVID prevention, waste management, and tourism fairness practices. Moreover, the material was suitable since it could be upgraded information from the related project before the Covid outbreak.
15) The problems and obstacles in the project	<ul style="list-style-type: none"> o What are the problems and obstacles in project management? 	QL	<ul style="list-style-type: none"> 1- None of the problems was solved 2- Slight problems were solved, and most still 	4	Almost all the execution problems were manageable, including the recurring COVID outbreak. The food safety and COVID prevention training was conducted online.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
management process	If any, define the problem and problem-solving process		<p>are obstacles to the project's achievement</p> <p>3- Some problems are solved, and the project can proceed, but did not produce the expected outputs</p> <p>4- Most problems are solved, and the project can proceed and produce the expected outputs</p> <p>5- All problems are solved, and the project can proceed, produce the expected outputs, and monitor the process as a lesson learned for the future</p>		However, the obstacle of using the on-site venue for the bathroom and toilet could not be processed since it was under lockdown and under other agencies' jurisdiction.
3.4 Overall Output evaluation: measure the immediate effect of the program and is aligned with the project objectives.					
16) Project's output	<ul style="list-style-type: none"> ○ How well has the project achieved its objectives (and sub-objectives)? ○ Identify the achieved outputs 	QT/QL	<p>1- None of the output achieved</p> <p>2- the project was partly achieved (less than 40% achievement)</p> <p>3- the project was partly achieved (less than 41%-60% achievement)</p>	4	Most of the outputs had been achieved, including the number of training participants, which was more than 500. However, even though the number of returning tourists exceeded the specified numbers, it would not come from the training alone or better quality of services alone, but also from the lift of the government travel ban.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			4- the project was mostly achieved (less than 61%-80% achievement) 5- All objectives are achieved (more than 80% achievement)		Moreover, the toilet and bathroom in Bang Saen had not changed since the jurisdiction problem.
17) Achievement of project objectives	<ul style="list-style-type: none"> ○ Do all project objectives and indicators meet the targets? ○ Identify the indicators which meet the targets and do not meet the targets 	QT	1- None or slight of the indicators meet the target (Less than 20% achievement) 2- 21%- 40% achievement 3- 41-60% achievement 4- 62-80% achievement 5- All indicators meet the targets (more than 80% achievement)	4	Most of the project's objectives and indicators met the targets. The number of trained enterprises exceeded the target, while the number of tourism operators was back on track. Also, the tourism communities improved their safety standards and procedures. However, the number of expected tourists would not meet the target within 2022. However, with lowering the COVID restriction, the number of tourists in the following year would exceed the specified number.
3.5 Outcome evaluation: concerned with the program's long-term effects and is generally used to measure the program goal. Consequently, outcome evaluation measures how well the program goal has been achieved.					
18) Measure the achievement of the overall goals	<ul style="list-style-type: none"> ○ Have the overall program goals been achieved? ○ Identify the goals that meet the targets and those that do not meet the targets. 	QT	1- None or slight of the goals achieved (less than 20% achievement) 2- 21%-40% achievement 3- 41%– 60% achievement 4- 61%-80% achievement	4	Almost all the goals were achieved, including training enterprises, improving the quality of services, and improving safety. However, it took time for many tourists to return to the pre-COVID era. The restaurant and food vendors had applied better sanitation and health standards and provided a visible price tag. Moreover, the tourism venue included a

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	<ul style="list-style-type: none"> Identify visible results or changes arising from the project 		5- All goals achieved (more than 80% achievement)		fire extinguisher and an arterial defibrillator. However, the bathroom and restroom in Bang Saen were still not getting better.
3.6 Specific Indicators (Project-based indicators) The impact of the project on achieving each Sustainable Development Goal related to the project					
19) The impact of the project on achieving each Sustainable Development Goal from 19.1 to 19.6 are economic indicators. There are no direct and measurable project indicators on environment and social outcomes.					
19.1) Identify Goals/Indicators SDG 8.1	Number of Tourists	QT/QL	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	1	The COVID-19 travel ban dampened the number of tourists to almost zero.
19.2) Identify Goals/Indicators SDG 8.3	Employment from the Project	QT/QL	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	1	Given the low budget, the project used only the human resources of the Department of Tourism and Municipalities.
19.3) Identify Goals/Indicators SDG 8.1	GDP	QT/QL	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	3	The impact would be more accurately measured after the lifted COVID-19 travel ban.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
19.4) Identify Goals/Indicators SDG 8.1 and implicitly 11.a.1	The number of Trained enterprises.	QT/QL	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	5	Over 500 small, medium, and large enterprises had undergone the training. Thus, it would promote inequality reduction and inclusiveness.
19.5) Identify Goals/Indicators SDG 8.1 and Implicitly 6.2.1	More Sustainable tourism.	QT/QL	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	4	The safety zone site would sustain its tourism communities and income with better sanitation and fairness.
19.6 Identify Goals/Indicators SDG 8.1	Simple Travel Cost	QT	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	5	If there were 100,000 trips on both sites, the average travel cost indicated the total willingness to pay for safety equal to almost 20 million baht.
3.7 Overall Impact Evaluation:					
20) Measure the project's overall impacts on the progress of SDGs Note: Evaluating from the <i>Specific Indicators</i> or project-level indicators.	○ How well does the output/outcome of the project achieve the progress of the SDGs, NDCs, and BCG components?	QL	1- None of the output/outcomes achieving progress on the SDGs 2- Slightly achieving 3- Moderately achieving 4- Much achieving 5- A great deal in achieving	3	The project improved tourism services. However, the outcome of an increase in GDP had to be measured in the future. Moreover, improving the health and waste management conditions in Nan Old Town and Bang Saen would indirectly enhance the SDGs' goal of sanitation and sustainable communities.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
21) Measure the project's overall impacts on the progress of NDCs Note: Evaluating from the <i>Specific Indicators</i> or project-level indicators.	<ul style="list-style-type: none"> ○ How well does the output/outcome of the project achieve the progress of the SDGs, NDCs, and BCG components? 	QL	1- None of the output/outcomes achieving progress on the NDCs 2- Slightly achieving 3- Moderately achieving 4- Much achieving 5- A great deal in achieving	1	The project was not related to NDCs.
3.8 Sustainability: Continuity of the benefits and impacts. The extent to which the net benefits of the intervention continue or are likely to continue.					
22) The project's net benefits of the intervention continue or are likely to continue	<ul style="list-style-type: none"> ○ Will the outputs last? ○ 	QL	1- Absolutely not. 2- Maybe not 3- Not sure / unclear 4- Very likely 5- Definitely possible	1	The training budget was for only one year. However, the safety procedure needed to be updated every year.
23) The project's flow of net benefits or the likelihood of net benefits continuing to deliver the outcomes and impacts over the medium and long term.	<ul style="list-style-type: none"> ○ Will the outcomes have the potential to deliver in the long term ○ 		1- Absolutely not. 2- Maybe not 3- Not sure / unclear 4- Very likely 5- Definitely possible	1	The municipalities suggested that the training should be ongoing every year. Thus, the one-year loan would not be enough to deliver a long-term outcome.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
3.9 Cost-Benefits Analysis on making project greener and more inclusive					
24) Estimate the benefit and cost to make the project greener or more inclusive Note: Environment (greener) /social (inequality & gender) / economic (income generation & employment)	○ Does the benefit outweigh the cost of making the project greener and more inclusive?	QL	1- Absolutely not. 2- Maybe not 3- Not sure / unclear 4- Very likely 5- Definitely possible	4	The benefit would undoubtedly outweigh the cost in Bang Saen, where the beach sanitation and food cleanliness would further boost new tourists and enhance revisited numbers of tourists. For Nan province, the fairness of the price and safety practices would increase the number of tourists, especially during the high season. Those results came from the simple travel cost survey conducted.

Remark:

* QT = Quantitative Indicators and QL = Qualitative Indicators.

3.2 Multi-Criteria Decision Analysis (MCDA) and Discussion

3.2.1 MCDA’s Results—Travel Safety Zone

The score of each MCDA criterion was in the following table and graph. It represented the five dimensions of project valuation: relevance, efficiency, effectiveness, impact, and sustainability. Notably, the Travel safety zone project scored relatively high on efficiency and effectiveness at 88 and 80 out of 100, respectively. The high scores stemmed from achieving the project's targeted goals with effective and efficient management. However, the impact score was low since it solely focused on economic impact but not on SDGs and NDCs. At the same time, the project's sustainability received a low score of 20 since the project relied solely on central government funds. Lastly, the relevance and coherence of the project received an average score since it did not consider NDCs. The detailed discussion is in the following section.

Table III(a) MCDA’s Results – Travel Safety Zone

Evaluation Criteria		Weight	Total Score	Travel Safety Zone
RELEVANCE/ COHERENCE	Project Design/Planning	20%	100	66.00
EFFICIENCY	Project Implementation	20%	100	88.00
EFFECTIVENESS	Overall Output / Outcome	20%	100	80.00
IMPACT	Impacts on SDGs and NDC	20%	100	31.67
SUSTAINABILITY	Continuity of the benefits and impacts	20%	100	20.00
OVERALL EVALUATION		100%	500	285.67

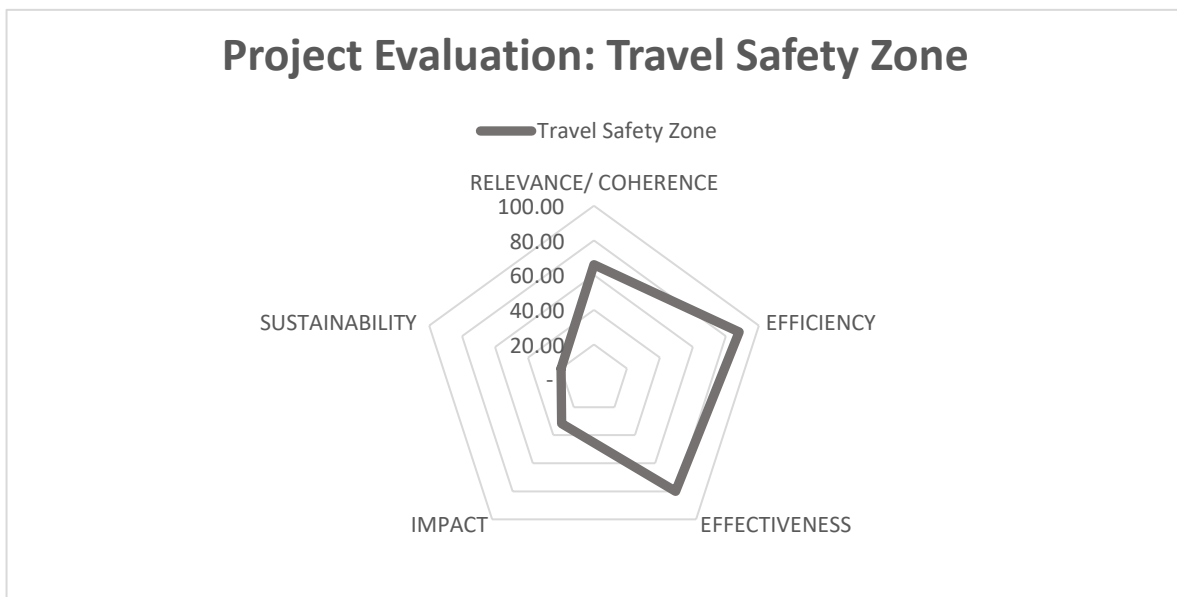


Figure III(a) Project Evaluation – Travel Safety Zone

3.2.2 Discussion

The travel safety zone project had the highest efficiency, effectiveness, and relevance/coherence evaluation scores. However, the project received a relatively low score on both impact and sustainability. The discussion of the results was as follows:

1) Relevance/Coherence

The travel safety zone project was pertinent across the program and policy cycle from design to implementation. Though its main design focused on swift economic recovery after the COVID outbreak, it is still partially linked to global goals such as the Sustainable Development Goals (SDGs). It helped the beneficiary and stakeholder needs by improving the chance and number of returning tourists, which is essential for sustainable income growth and developing resilient and robust tourism communities. The project came at the right time since most of Thailand's tourist spots had to shut down during the pandemic and be ready for reopening. However, the quality and design of the project focused on swift gain and income recovery. Thus, it would not be directly linked to environmental and social development goals if the project extended to other spots over time and kept getting the new budget. Over time, the project design would be relevant to economic, environmental, and social SDGs. However, the project needed to be coherent with the NDCs committed by the Thai government.

The project had internal coherence with the work of both national and municipal level government agencies' policies. Nan and San Suk municipalities aimed to be popular and sustainable tourist spots before the COVID outbreak. They created both venues for local vendors and the preservation of national heritage and natural beaches. Thus, making the zones safer would further enhance their competitiveness and complement local communities' aspirations. Moreover, the project aligned with external policy commitments such as the SDGs and was indirectly considered in this project's design and implementation. The project focused directly on SDG 8, economic growth, and employment and indirectly helped with better sanitation in SDG 6 and sustainable communities in SDG 12.

2) Efficiency

The allocated budget and human resources were appropriate and sufficient for training and promotion in five pilot travel safety zones. The participatory training in safety and sanitary standards was sometimes subject to delays and the low number of participants due to the social and epidemic complexity of the local issues: shutdown of travel and cross-provincial traveling. Thus, the compounded adverse factors partly inhibited the efficient use of resources and led to cost overruns. However, the responsible agency keenly switched to online platforms for special training and used the resources more effectively and promptly.

3) Effectiveness

From the interview and survey, the project achieved desirable outcomes. The outcomes were the number of trained enterprises and a handbook for safety and sanitation standards. Moreover, the municipalities used internal resources to set up the monitoring system to sustain the outcome and strengthen collaboration with beneficiaries. In addition, the trained enterprises and vendors had changed their business conduct to ensure travel safety, sanitation, and fair practices for tourists. However, given the Covid pandemic, there were several unintended effects. For example, bathroom and restroom standards training has not been possible since the traveling ban.

4) Impacts

The impact on SDGs and NDCs was quite limited because, by design, the project solely focused on one aspect of SDGs: tourism income recovery. Moreover, if the project had continued, its indirect effect would have been positive and linked to SDGs 6 and 12. Moreover, the project had no direct or indirect link with NDCs. Thus, the project yielded a relatively low impact on the big picture of project evaluation.

However, within its impact on SDG 8, the project profoundly contributed to the significant change in the business practice of the intended beneficiaries by increasing the traveling site safety and sanitation with repetitive checkups from municipal officers. Also, the training covered intended target groups, including the most disadvantaged and vulnerable vendors. The training benefits spread throughout the intervention time. The project helped shape the enterprise to treat tourism fairly as a critical goal for sustainable tourism and communities. Lastly, the intervention could not lead to other changes, including "scalable" or "replicable" results, since the training and monitoring budget was only for one year. Therefore, those impacts would be minor and decrease over time.

5) Sustainability

The knowledge of travel safety standards was an ever-evolving field that required careful attention and was specific to each travel site. Hence, the project should build an environment that enables sustainable development. However, with the limited loan-financed budget, that would no longer be available for the next budget year. Moreover, the project's success required continuous change monitoring by enterprises and local beneficiaries. Hence, continuing net benefits created by the already evident intervention would gradually decrease. Moreover, it would be hard to distinguish the sustainable impact of the project since it would take many years for the benefit to come to fruition. That is, the sudden return of tourists should come from lifting out of the lockdown; however, the following year, recurring return of tourists would come from travel safety practices.

The overall evaluation depicted effective and efficient intervention in the intended beneficiaries group. The training and promotion would promote the local enterprises' knowledge and practice regarding travel safety zones. Though the project satisfied the intended output, it should not have a high impact on SDGs and NDCs, given its limited budget and discontinued budget for extending the project to the same pilot zones or other travel sites.

4. Project Value for Money

4.1 Project's Costs

The project's public cost came from a 15 million loan-finance budget, and those were comprised of training materials, venue, and promotion packages. Moreover, the opportunity costs were that the small enterprises had to send their manager or owner for training for one or two days. However, from the survey of vendors, they said that the content of the training was good, and the time was appropriate. Thus, the project cost was only within the acceptable ballpark for the project staff and the beneficiaries.

4.2 Project's Benefits

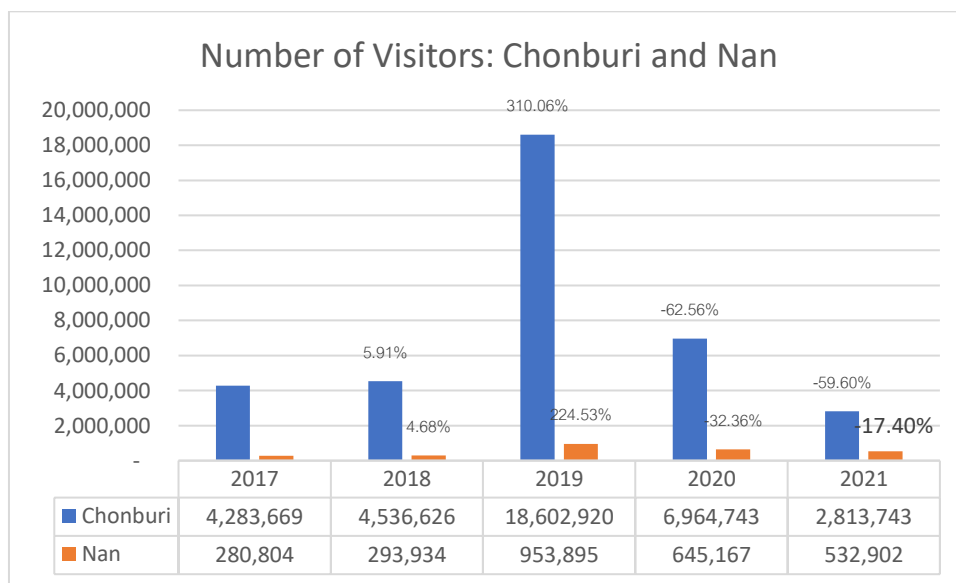
The training project would enhance local enterprises' safety and standards in each pilot traveling safety zone. However, the benefit would not be measurable from the beneficiaries' perspective at first. Nan and Bang Saen were banned from traveling during training since the COVID-19 outbreak. However, the benefit would start accumulating in terms of returning and recurring tourists who would feel that these sites were clean, safe, and had good sanitary standards. Thus, the benefit would be only longer than the project's lifespan.

The methodology of getting a willingness to pay came from the nonmarket valuation method, as in the standard textbook of Parsons (2013). The designated questionnaire was derived from the underlying theory of the Random Utility Model to estimate the willingness to pay for travel sites with differing attributes. The economic model focused on finding either conditional or unconditional average willingness to pay. Several studies applied the concept in evaluating the willingness to pay for travel safety (Hess et al., 2017), (Molin et al., 2017), (Ngoc et al., 2022); and (Ringle et al., 2011). Moreover, the model could cover the specificity of traveling to the Beach and city with shopping venues, as in the case of Bang Saen and Nan. The application of travel cost in beach safety and cleanliness studies found a significant increase in willingness to pay (Leggett et al., 2018), and (Wairo et al., 2020). At the same time, the study on shopping trips during the Covid outbreak showed a change in willingness to pay for travel costs (Wang et al., 2021) and (Zaman et al., 2021). Thus, according to the travel cost survey, the average willingness to pay (WTP) for safety would be 200 baht per trip.¹

Then, the total value of the private benefit from the travel safety zone equated to the WTP multiplied by the number of trips and the ratio of travelers willing to pay for enhanced safety. In this study, the number of trips equaled the number of travelers to Nan and Chonburi, which was divided by two to represent two people per trip. The number of trips with the willingness to pay would be at thirty percent since the survey showed that the probability of paying for enhanced safety covers only thirty percent of the sample. The number of travelers to Nan and Chonburi was as follows:

¹ The data comes from only Thai tourist. Therefore, the average number did not take into account the willingness to pay of foreign tourist.

The number of travelers or visitors to Chonburi and Nan had dropped sharply since the pandemic outbreak 2019. The decline was 62 percent for Chonburi and 32 percent for Nan. Thus, the base case for the number of trips would be the number of visitors in 2020 divided by half. Then, the final base case for the private benefit of the travel safety zone would be equal to 3.2 million and 90 million baht for Nan Old Town and Bang Saen Beach, respectively. This private benefit from a willingness to pay had already exceeded the public cost of 15 million baht. However, to make the cost-benefit analysis more robust, the consultant varied the payment ratio from 30 to 20 percent and 10 percent, respectively. The results of willingness to pay still outpaced the public cost of 15 million baht. At a ten percent payment ratio, the Nan private benefit would be 1 million baht, while the benefit in Bang Saen would be 30 million baht.



Source: Ministry of Tourism and Sports.

Figure III(b) Number of Visitors to Chonburi and Nan

Table III(b): Sensitivity Analysis baseline of payment ratio (baht)

Total Private Benefit			
Sensitivity	10 percent payment	20 percent payment	30 percent payment
Nan	1,088,719.31	2,177,438.63	3,266,157.94
Chonburi	30,106,198.13	60,212,396.25	90,318,594.38

Source: Calculation by researcher

Thus, under the given assumptions, the number of trips would be 3 million per year. However, the benefit would be high and discontinue in the following year since the project required new knowledge and monitoring over time. The benefit would not be sustainable.

4.3 Overall Evaluation

In conclusion, the project's benefits outweighed the cost. The project's cost was limited to only 15 million baht for five travel safety zones. However, from the surveys of the two sites, Nan and Bang Saen, the average willingness to pay for travel costs would be 200 baht per trip. Under the assumption that there would be three million trips per year to Nan and Bang Saen. The benefits would outweigh the costs. However, the benefit would stem from an increase in tourists. During the pre-covid time, there were statistics that more than 3 million tourists went to Nan and Chon Buri each year. Thus, if the project could keep increasing the safety of the travel site along with the increasing number of tourists, the project's benefit would significantly outweigh the cost. However, the previous studies (Leggett et al., 2018) and (Zaman et al., 2021) confirmed the importance of sustainability of safety travel as a key to increasing the willingness to pay and benefit from the project.

5. Project overall assessment and lessons learned

5.1 Strengths

Despite the COVID outbreak, the project and its corresponding agent proved their resiliency in carrying on the training and got a desirable number of participating enterprises and stakeholders. The first critical strong point was the inclusiveness of the project since the training design. Department of Tourism worked laboriously with local municipalities to determine the heterogeneous training materials and programs suitable for each enterprise and stakeholder. Moreover, both Bang Saen and Nan's municipalities tried to engage considerable numbers of local enterprises based on their respective economic activities.

The second strong point was the thoughtful consideration of sanitation and safety standards. The developed guidelines and handbook covered most tourism enterprises, including hospitality management, food and souvenir vendors, restaurants, and tourist attractions. Moreover, it stressed the importance of bathroom and restroom cleanliness and the need for a fire extinguisher and arterial defibrillator in popular tourist spots.

The last strong point was the keen utilization of the Department of Tourism network and its close relationship with local municipalities. To ensure that the training would be suitable for stakeholders, the Department of Tourism also worked closely with the municipalities in identifying critical stakeholders and beneficiaries. Together, they identified the training location and necessary local resources and set up the monitoring system to continuously improve the training results and get a feedback loop to related stakeholders.

5.2 Weaknesses

The travel safety zone project had three critical weaknesses: Rush, Limited budget, and insufficient capacity building. The project's main objective was to help in economic recovery; therefore, there was less consideration for SDGs and NDCs. With enough time and budgeting, the project could incorporate those long-term gains better. Moreover, with

the small budget of fifteen million baht, the project's impact could not extend to other travel sites as well as the impact would only last for one or two years before time, rendering the training obsolete. Lastly, with insufficient capacity building and factors to support the vending of vendors, the training could not cover essential topics such as place management and how to promote the travel safety zone to the broader audience.

From these observations, the critical lessons learned for the improvement of this project were designing a better implementation and timing suitable for seasonal tourism peak and off-peak in Thailand. The allotted schedule would be sufficient to improve place infrastructure and sanitation practices. The project's success, efficiency, and effectiveness hinged on the strong collaboration with local municipalities that had enough resources to carry out the program. Thus, a decentralizing project through the budget, planning, and implementation at the municipal level would help select vendors, venues, and activities and prepare specific infrastructures required for bathrooms and toilets. Though both Nan and Bang Saen Beach could be a showcase for project success, there should be a more allocated budget to municipalities for the long-term continuity and sustainability of the project. The travel safety zone project could extend to cover sustainable tourism management and increase the participation of local stakeholders by using local municipalities as well-equipped spearheads. With an increased budget, local municipalities could create sufficient improvement of travel sites through place management and digital marketing, as in the case of Bang Saen Beach.

6. Project-Based Recommendations

The recommendation focuses on making the future project to be greener and more inclusive (environment (greener), improving social (inequality & gender) issues, and contributing to sustainable economic growth (income generation & green jobs).

6.1 Process Improvement: Project Cycle Process, including Project Design, Planning, and Implementation

- The project should design and plan to make economic recovery more sustainable through specific goals such as building a better public bathroom and restroom.
- The project can incorporate risk management regarding the epidemic outbreak and travel plan.
- The future project can include a specific site visit and focus group in planning the future training package.
- The embedded relationship between central officers, municipalities, and local enterprises should extend to any future sites.
- Using social media and digital technology to follow training and monitor should reduce the cost of training and sustainably extend the benefit to the other travel zones.

6.2 Process Improvement: Project Outputs, Outcomes, and Impacts on SDGs, NDCs, and BCG Component

- The project can incorporate SDGs into the impact of the project.
- The depiction of the success case would enhance the possibility of extending the project to other sites. In addition, stressing the role of SDGs 6 and 12 would make the project more scalable and replicate to the other respective sites.
- Given the small budget and resources of the project, NDCs and BCG elements could not be incorporated into the project output, outcome, and impact. Thus, replication should focus on the critical success impact as a recurring tourist. Then it can link to sanitation as a key for recurring tourists who promote more sustainable communities.
- If the project must cover NDCs and BCG, it should pick only one output or outcome of BCG that might be related to using an electronic safety vehicle for each travel site.

6.3 Capacity Building

- The project's commendable capacity building could cover a further extensive list of small stakeholders in the Thai tourism industry. That is, it can improve on already strong capacity-building outreach to small enterprises and communities.
- Furthermore, future capacity building should focus on green and climate-responsive tourism. This capacity building follows the upcoming trend of the global tourism industry since it links improvement of safety, green, and hygiene with the potential of creating a higher value chain.

6.4 Research and Innovation

- Limited research and innovation toolkits link climate change and SDGs to the development of the Thai tourism industry. Thus, the government should support the further extension and outreach of safety zones through research, knowledge management, and dissemination in line with sustainable tourism.
- Research and development should focus on proper budgets and long-term plans that sustainably increase revenue and are environmentally friendly.

6.5 Transformative Partnership and Financial Sustainability

- Creating long-term partnerships in the green and inclusive tourism industry requires a sustainable budget for existing places and vendors. Budget coordination should be done among relevant agencies within the Ministry of Tourism and local municipalities. Thus, the transformative partnership hinges on initial support from the central and local government regarding budget and staffing; continuous support encompassing decentralized revenue collection and generation would keep the travel safety zone afloat.

6.6 Matrix of Suggestion Relevance

The following table summarizes the policy recommendations based on the project evaluation aspect.

	Relevance & coherence	Efficiency	Effectiveness	Impacts	Sustainability
Process improvement	x	x	x	x	x
Capacity building	x			x	x
Transformative partnerships					x
Research and innovation				x	x
Financial sustainability					x
Legislative					
Others					

References

- Hess, S., Murphy, P., Le, H., & Leong, W. Y. (2017). Estimation of new monetary valuations of travel time, quality of travel, and safety for Singapore. *Transportation Research Record, 2664*(1), 79–90.
- Leggett, C. G., Scherer, N., Haab, T. C., Bailey, R., Landrum, J. P., & Domanski, A. (2018). Assessing the economic benefits of reductions in marine debris at Southern California beaches: A random utility travel cost model. *Marine Resource Economics, 33*(2), 133–153.
- Molin, E., Blangé, J., Cats, O., & Chorus, C. (2017). Willingness to pay for safety improvements in passenger air travel. *Journal of Air Transport Management, 62*, 165–175.
- Ngoc, A. M., Nishiuchi, H., Van Truong, N., & Huyen, L. T. (2022). A comparative study on travel mode share, emission, and safety in five Vietnamese Cities. *International Journal of Intelligent Transportation Systems Research, 20*(1), 157–169.
- Parsons, G. R. (2003). The travel cost model. In *A primer on nonmarket valuation* (pp. 269–329). Springer.
- Ringle, C. M., Sarstedt, M., & Zimmermann, L. (2011). Customer satisfaction with commercial airlines: The role of perceived safety and purpose of travel. *Journal of Marketing Theory and Practice, 19*(4), 459–472.
- Wairo, C. M. C., Pellokila, M. R., & Gimin, R. (2020). Analysis of willingness to pay for coastal tourism services of Lasiana Beach and Batunona Beach with travel cost method approach. *International Seminar on Sustainable Development in Country Border Areas, 2*(1), 94–121.
- Wang, K., Liu, Y., Mashrur, S. M., Loa, P., & Habib, K. N. (2021). COVID-19 influenced households' Interrupted Travel Schedules (COVHITS) survey: Lessons from the fall 2020 cycle. *Transport Policy, 112*, 43–62.
- Zaman, U., Raza, S. H., Abbasi, S., Aktan, M., & Farías, P. (2021). Sustainable or a butterfly effect in global tourism? Nexus of pandemic fatigue, covid-19-branded destination safety, travel stimulus incentives, and post-pandemic revenge travel. *Sustainability, 13*(22), 12834.

IV. Project Evaluation Report: Upgrading the economy in the Central-Western Economic Corridor using the BCG model¹

1. Project Background/Attributes

The research community introduced the Bio-Circular-Green Economic Model, or BCG, and promoted it by the Thai government as a new economic model for inclusive and sustainable growth. The BCG model capitalizes on the country's biological diversity and cultural richness strengths and employs technology and innovation to transform Thailand into a value-based and innovation-driven economy. The model conforms with the UN Sustainable Development Goals (SDGs) and aligns with the Sufficiency Economy Philosophy (SEP), also the fundamental principle of Thailand's social and economic development. The BCG model promotes four industries – agriculture and food; medical and wellness; bioenergy, biomaterial, and biochemical; and tourism and creative economy.

Thailand Central and Western Economic Corridor (CWEC) covers Phra Nakorn Si Ayutthaya, Nakhon Pathom, Suphan Buri and Kanchanaburi. The corridor is a production base for organic foods, smart farming, and a logistics network to link Bangkok, the Eastern Economic Corridor (EEC), and Myanmar. Therefore, the Thailand Institute of Scientific and Technological Research (TISTR) proposed using a loan budget of 100 million baht to create BCG Infrastructure & Facility Development, a pilot and demonstration plant under the National Economic Recovery Plan, and BCG in Action under the National Development Strategy. The proposed pilot plant will produce agricultural microorganisms and freely distribute them to interested farmers to reduce the farmer's cost of access. The primary use of microorganisms would be either complement or substitute to the chemical pesticide; those would reduce the use of the chemical product and help promote the farmer's health. The project also covers extensive BCG Capacity Building. This enabler aims to develop knowledge in the adoption and practical use of microorganisms for farmers and government officers.

1.1 Responsible Agency:

Thailand Institute of Scientific and Technological Research (TISTR)

1.2 Descriptions:

The COVID-19 pandemic outbreak has adversely affected both Thailand and other countries globally. It has changed people's ways of life and careers in every way of life, especially in the agricultural sector. Most Thai farmers have suffered from the semi-lockdown and disruption of local and global economic activities. Thus, the revenue from domestic sales and exports has steadily declined. In addition, the higher cost of production

¹ This part of assessment section is under supervision of UNIDO solely and no association to UNDP.

and lack of value-added activities reduce the competitiveness of the Thai agricultural sector and exacerbate the negative environmental externalities of agricultural production. From microeconomic perspectives, agricultural entrepreneurs, communities and community enterprises, and small and medium enterprises throughout the value chains have also suffered from the outbreak.

Therefore, to mitigate the adverse effects and pave the way for the New normal for the future of the Thai people, there is an urgent need for social and economic recovery with the proper use of science, technology, and innovation. Such projects would promptly cater to each specific location's urgent needs and usage and promptly reflect each community's needs. Moreover, the outcomes of the projects should lead to proper agricultural sector recovery. In addition, according to the 12th National Economic and Social Development Plan (2017-2021), the Thai government steers toward a regional economic development plan to boost development and reduce each regional problem. There are four specific regional economic development zones: Eastern Economic Corridor (EEC), Northern Economic Corridor (NEC - Creative LANNA), Northeastern Economic Corridor: NeEC - Bioeconomy), Southern Economic Corridor (SEC), and Central and Western Economic Corridor (CEWC). Under the setup of CEWC by the National Economic and Social Development Council Office (NESDC), the office tends to drive the regional economic development of Bangkok and the central region of Thailand. Therefore, at the initial stage of development, CEWC covers four provinces: Kanchanaburi, Suphanburi, Phra Nakhon Si Ayutthaya, and Nakorn Pathom. The corridor aims to enhance job opportunities and increase income distribution among the locals; furthermore, it would cover industrial capacity enhancement and the new S-curve industry. These traditional and new industry developments will help develop the regional grassroots economy.

The initial CEWC covers four provinces and is the primary agricultural production base for field and perennial crops. The significant field crops are rice, sugar cane, cassava, and sweet corn, while the essential perennial crops are sweet young coconut, pomelo, lime, and asparagus. The total area of plantation for both crops is 10,650,074 rai. The first three field crops have the highest area of the plantation.

- 1) The rice plantation area is 1,760,404 rai.
- 2) The sugar cane area is 1,440,549 rai.
- 3) The cassava area is 518,827 rai.

Though the plantation area is much smaller for the perennial crops, asparagus and pomelo are high-value produce. For example, per rai, the pomelo farmer would earn a revenue of 240,000 baht.

Besides being a vital plantation hub, CEWC is a strategic location that links the trading and transportation route between the Eastern Seaboard and the Western Sea. The corridor has developed communication, transportation, and logistics infrastructure to link with the other regions conveniently and speedily. Also, it has several prominent academic institutions that could support research and development, science, technology, and

innovation. Those academic services can enhance the value-added goods and services in the corridor. However, three obstacles and threats to agricultural sectors within the region are as follows: 1) resources and factors of a production problem, 2) health conditions of both consumers and producers' problems, and 3) marketing problems.

The factors of production problems consist of land, agricultural land rent, and water. These problems lead to lowering small-scale farmers' capacity as well as productivity. Moreover, the heightening production cost of labor, fertilizer, herbicide, and pesticide leads to more cost of production. The higher cost of production and misinformation about pesticides foster the overuse of such chemicals that adversely affect the environment, contaminate the land, compromise product safety, and cause health problems for farmers and consumers. In addition, the overuse of chemicals can also harm the export market.

According to the official statistics of the Office of Agricultural Economics, in 2019, chemical fertilizer was imported at 5,022,101 tons with a value of 50,970 million baht. There are three crucial import goods for pesticides: 1) Herbicides with an import value of 8,055 million baht at 88,846 tons 2) Fungicides with an import value of 6,942 million baht at 19,334 tons 3) Insecticides with an import value of 5,548 million baht at 16,897 ton. The usage of herbicides contributes to one-third of the cost of crop production. Thus, precision farming, prescribed fertilizer, and regionalized technology would further reduce the cost of agricultural production. Moreover, organic chemicals and fertilizer production are vital to further reduce the cost, alongside microbial pesticides as a complement or replacement for chemical pesticides.

There is a need to develop or use accessible technology to expand the microbiology fermentation and biocontrol substance. The technology invested would reduce production time and enhance microbial potency, which reduces the cost of agricultural chemical substances and chemical contamination in both environmental and agricultural products. Thus, it would reduce the harmful effects of crops on both farmers and consumers.

Without the project, the Thailand Institute of Scientific and Technological Research (TISTR) has the hardware for microbial production (two fermenters with *a 300-liter capacity*) that can produce only 30,000 liters per year of concentrated, effective microorganisms. The concentrated liquid provides the initial microorganism for the local fermenter tank and helps farmers produce both farm and perennial crops. The current capacity covers the farm crops (rice, sugar cane, and cassava) plantation area of 60,000 to 75,000 rai per year with 80-100 liter per rai. It covers perennial crops (cavendish and ladyfinger banana, asparagus, and sweet young coconut) in plantation areas of 50,000 to 60,000 rai per year with 100-120 liter per rai.

Therefore, the project asks for support for increases in the fermenter capacity. The new fermenter, with a capacity of *2,000 liters*, and the freeze-dried system at the end of the product line would enhance the production of concentrated, effective microorganisms and biocontrol up to 130,000 liters per year. The local farmer's fermenter will receive more microorganisms. Moreover, the new crop coverage will be the farm crops (rice, sugar cane,

and cassava) plantation area of 260,000 to 325,000 rai per year with 80-100 liter per rai. It covers perennial crops (cavendish and ladyfinger banana, asparagus, and sweet young coconut) in plantation areas of 200,000 to 216,000 rai per year with 100-120 liter per rai. In addition, the freeze-dried system would enhance the productivity of producing microorganisms from concentrated liquid to granulated powder. The powder has 6 months more storage time, is more convenient to store, and increases value twice.

After the project approval, apart from fermenter operation, TISTR cooperated with a network of farmer councils, provincial agricultural offices, local community enterprises, entrepreneurs, and academic institutions to set the shared targets. These targets are the solution to the regions' current problems and urgent needs. The first problem is related to sugar cane. Sugar cane farmers face lowering the price, and there is a need to increase the value-added from sugar cane waste management. The sugar cane industry must develop non-food products as environmentally friendly packages from decomposable cane pulp and food products such as sugar cane for functional food. There is a need for cost reduction from chemical fertilizer and pesticide use in the rice industry. For the banana farmer, there is a problem of low productivity, the need for quality improvement, and new system development for harvesting bananas that prompt the use of the dwarfed banana plant. There is a need to develop functional coconut food for young coconut farmers. For pomelo farmers, there is a problem with waste management that prompts using pomelo leftovers to develop food supplements and medicinal cosmetics.

TISTR has designed a new project called "Economic Improvement in CEWC by BCG Model" based on the above opportunities and problems. The project applies scientific knowledge to solve the stated area-based problems by developing process innovation, creating value-added from agricultural waste, and using innovation to create new products from old ones. The new product will respond to the demand from both consumers and the market.

Upstream technologies include precision fertilizer and agricultural microorganisms. The middle stream technologies are non-food and agricultural technology, which includes functional food and hygiene. The middle-stream products require technology and services such as biological extraction of nutrition agents, synthesis of functional and active ingredients, and food ingredients such as healthy extracts from plants and bacteria. For downstream production, the development of biological packaging focuses on using excess raw material or leftover biological products from an industry that can enhance the value-added of the new packaging.

These base technologies increase competitiveness, comparative advantage, and value-added of agricultural goods. The goods would be responsive to the needs of domestic and international consumers while reducing the waste from the agricultural production process and its related industries. In addition, TISTR research and technology support the extension and production at the industrial level. TISTR has a Food Innovation Service Plant (FISP) with modern machines that pass the Thai FDA standard. Also, the TISTR Innovative Center for Production of Industrially Used Microorganisms (ICPIM) is ready for technological development, incubation, and extension services to entrepreneurs.

In addition, TISTR has a pool of capable researchers who have experience in the innovation and development of products and technology. Furthermore, they are skilled in transferring technology to the local entrepreneur. TISTR is ready to carry out the projects and gear them toward desirable outcomes: increasing competitiveness of the agricultural and industrial sectors, labor development, the extension of the industrial capacity, and building up the new industrial base. Those outcomes, in return, would foster the development of the local grassroots economy.

Technical Note: Role of TISTR

TISTR has a research and development mission and applies science and technology to benefit society. TISTR fosters economic and social development based on area-based needs and operations. TISTR has conducted many projects according to Thai government policies; for example, One District One Agricultural Innovation, Scientific Coupon for One Tambon One Product (OTOP), Innovate Agriculture (InnoAgri) OTOP production development in targeted ten provinces. Under the guiding mission, TISTR works with the network organizations in the CEWC to learn about their problems and needs. Thus, TISTR uses its expertise to apply and work out solutions for each area, while the solution focuses on using knowledge, innovation, and technology to increase added value. In addition, TISTR's knowledge base and expertise help solve the problem of increasing productivity, improving production, and enhancing environmentally friendly technology. The expected results will be an uplifting development of high-value-added products suitable for Thailand and the BCG model.

In addition, the investment in fundamental science projects has created the opportunity for farmers to reach for the beneficial use of science, technology, and innovation that would provide a return in economic value, create jobs, increase revenue, and reduce cost. The participating entrepreneur would be able to develop and produce new microorganisms and biocontrol products under TISTR research and development, which would lead to more jobs, the development of a safe agricultural product system, and organic production. The readily available technologies are precision agriculture, circular economy systems, and green and environmentally friendly technology such as food, pharmaceutical, and packaging. The extension for potent microorganisms would cover more crop areas in Thailand to reduce and prevent widespread plant disease and insect clusters. It would enhance the economy based on biotechnology and resources, promote a circular economy, and a green economy with environmentally friendly technology. Thus, it would benefit the safety of producers and consumers and the environment throughout the value chain of the bioeconomy.

Scope of the evaluation: Sub-project selection

The project of upgrading the economy in the Central-Western Economic Corridor using the BCG model has several sub-projects that fulfill a variety of SDG indicators and have different work processes and stakeholders. Therefore, the evaluation of this project consists of only one main sub-project, procuring and running a new fermenter with a capacity of 2,000 liters and a freeze-dried system for microorganisms; moreover, the

distribution of microorganisms to farmers is in the evaluation process. The reason for choosing this subproject is that this subproject is the most important, and TISTR spent more than 86.69 percent of the total project budget (more than 100 million baht out of 115.36 million baht). Therefore, the evaluation of this section focuses only on this subproject, procuring and running a new fermenter and distributing microorganisms from the TISTR to its networks, which are provincial agricultural offices/community leaders and farmers, as shown in the figure below.

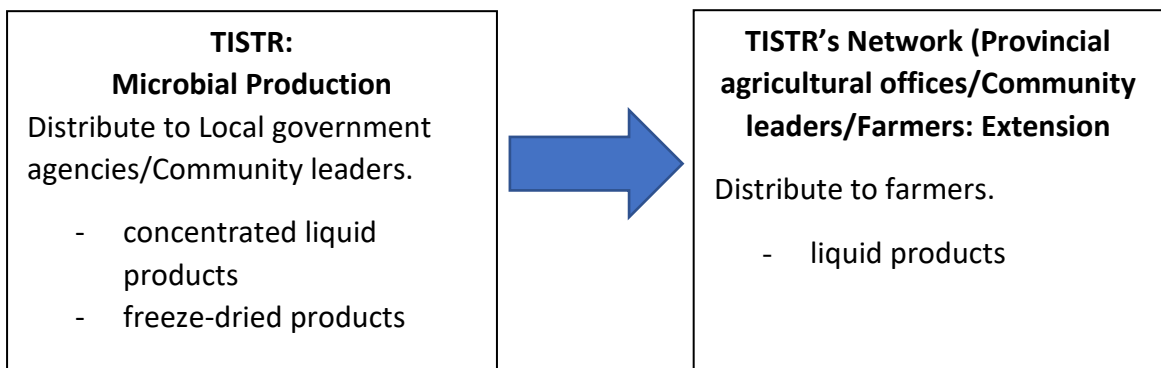


Figure IV(a) TISTR' Network to distribute microorganisms

The processes of the subproject are that TISTR utilizes the new microbial production plant (figure 4.2a) to produce concentrated liquid and freeze-dried products. Then, TISTR cooperates with the provincial agricultural offices and community leaders to train farmers to use microorganisms and distribute the products to farmers. The products that TISTR distributes to the network are concentrated liquid; hence, the provincial agricultural offices and community leaders will use the small machine (figure 4.2b) to transform the concentrated products to be ready-to-use and distributed to farmers.



Figure IV(b) The processes of the subproject are that TISTR utilizes the new microbial production plant

In general, fewer agricultural stores provide microorganism products compared to chemical products. The shorter shelf life of microorganism products makes them less popular than chemical products. Another benefit of the new microbial production plant is that agricultural SMEs which produce inputs for agriculture can cooperate with TISTR by using the new plant to produce their products without investing a massive amount of money for the plant. Then, the cost and price of microorganisms sold by these SMEs will be lower, giving farmers more incentive to try and use microorganisms. Moreover, this will increase the supply of microorganism products in the market, with fewer stores supplying microorganism products for farmers.

1.3 Project Status (as of 28th October 2022)

Project completed:	31 st December 2021
Total approved budgets:	115,359,800 baht
Total used budgets:	115,359,800 baht (100%)

1.4 Project Objectives: The objective of the subproject is to improve the agricultural production process by applying technology and innovation to reduce costs and environmental impacts.

1.5 Target Group: The target groups of the sub-project are:

- 1) Farmers who used microorganisms in their agricultural land or are interested in using microorganisms in the future, and
- 2) Agricultural SMEs used the new microbial production plant to produce their microorganism products and supply them to market.

1.6 Subproject Goals:

Produce agricultural inputs (microorganisms) to reduce cost and environmental impact in Kanchanaburi, Suphanburi, and Nakorn Pathom.

1.7 Subproject Activities and Disbursements (as of 31st December 2021):

Activities	Budget disbursement (mil. baht)
<p>Enhance the production of modern crop cultivation through the application of technology and innovation, enhance the competitiveness of the production process, and reduce cost and environmental impact.</p> <p><i>Remark:</i> The budget for training and distribution of microorganism products was aggregated from other subprojects.</p>	<p>100 million baht for the investment budget</p>

1.8 Geography:

The project locations are Kanchanaburi, Suphanburi, Phra Nakhon Si Ayutthaya, and Nakorn Pathom, while the locations of the subproject are all previous provinces except Phra Nakhon Si Ayutthaya. The location for the subproject evaluation is Suphanburi and Kanchanaburi provinces. Each province is an amalgamation of field and perennial cropland areas in the same province. Therefore, a project that helps in green recovery and enhances agricultural productivity proves the mutual co-benefit of improving environmental quality and maintaining agroindustry competitiveness. The provinces' main agricultural products are comprised of farm crops and perennials, which would benefit significantly from introducing new microorganism technology and biocontrol. The rice plantation would use more organic fertilizer, which could supplement traditional chemical fertilizers to increase productivity in the long term. At the same time, biocontrol would reduce the use of chemical pesticides, which are harmful to both consumers and farmers. Thus, the province has the potential to be a showcase for green recovery from Covid-19. Thus, the location is an excellent tentative location for evaluation and response to the needs of the project stakeholders, ranging from the farmers, community enterprises, and government organizations.

1.9 Outputs: Outputs of the subproject are:

Outputs	Goals
Number of farmers trained to use microorganisms	50 farmers
Microorganism products	5 products

1.10 Outcomes: The subproject's outcome is to increase farmers' income by reducing costs and decreasing the negative impact on the environment.

2. Project Site Visits

The data for project evaluation and cost-benefit analysis comes from the following:

- 1) In-depth interviews with TISTR officers. They were executive officers, researchers, and internal project evaluators. The consultant participated in the pilot's factory tour and browsed through the specifications of the new machine and plant setup.
- 2) The consultant interviewed extension officers from the Ministry of Agriculture stationed in Suphan Buri and Kanchanaburi. These key extension officers work closely with TISTR to promote microorganism adoption and distribution of free microorganisms.
- 3) The consultant orchestrated two focus groups with the local farmers in Suphan Buri and Kanchanaburi. The focus group at Suphan Buri focused on vegetable farmers, while the focus group at Kanchanaburi focused on field crops.

Details of data collection are in the following Table.

Project Site	Date/Time	List of Informants
TISTR		
Online	1 st Meeting 19th May 22 at 10.00-11.00 a.m. / Zoom 2 nd Meeting 21st July 22 at 10.00-11.00 a.m. / Zoom 3 rd Meeting 10th August 22 at 09.00- 10.30 a.m. / Zoom	TISTR representatives (executive officers, researchers who conducted the selected subproject, and project evaluator)
Pathum Thani Province		
TISTR and ICPIM factory* Khleng 5, Khleng Luang, Pathum Thani, Thailand.	4 th Meeting 11th August 22 at 09.00 a.m.-12.00 p.m.	TISTR representatives
Suphan Buri Province		
Provincial Agricultural officers	5th October 22 at 2.00- 3.30 p.m. / Zoom	Director of Provincial Agricultural Offices
Agricultural Technology Promotion for Plant Protection, U-Thong District	17th August 22 from 9.00 a.m.-12.00 p.m.	Director of Technology Promotion Center
Farm Visit; Community Pesticide Center U-Thong District	17th August 22 from 1.00 - 4.00 p.m.	Farmers participating in the subproject (4 farmers)
Kanchanaburi Province		
Provincial Agricultural offices; Plant Protection Group, Department of Agriculture Mueang Kanchanaburi, Kanchanaburi,	18th August 22 from 9.00 a.m.-12.00 p.m.	Head of the office: Plant Protection Group
Farm Visit; Community Pesticide Center Mueang Kanchanaburi, Kanchanaburi,	18th August 22 from 1.00 p.m.-4.00 p.m.	Farmers participating in the project (2 farmers)

2. Multi-Criteria Decision Analysis (MCDA)

3.1 The Set of Evaluation Criteria and Score

The set of evaluation criteria emphasizes the project cycle process of project design, planning, and implementation as well as the output, outcome, and impacts on SCGs, NDCs, and BCG components to learn that the project has been well developed to achieve their goals and objectives and evaluate how it impacts on the sustainability and green recovery.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
3.1 Project Design					
1) Identifying project target group needs in setting objectives	<ul style="list-style-type: none"> - How was the project designed with its objectives? - Are there any forms of need analysis or supported information to set the project objectives? <p>* Identifying the evidence showing the target groups and stakeholders' involvement in project design and setting its objects process.</p> <p>In the case of using the bottom-up approach,</p>	QL	<ul style="list-style-type: none"> 1- No evidence identifying procedure to define the project needs before setting the project objectives. 2- Mainly setting the objectives by using a top-down approach, slightly bottom-up to get the needs of the target group, 3- Mainly setting the objectives by using top-down, have some needs gathered from the target group 	4	The sub-project objectives came from the TISTR management team and researchers. Moreover, the decision followed the central government policy that supports the Bio-Circular-Green Economy (BCG economy), the new sustainable growth engine. The process was top-down decision-making. In addition, TISTR has already worked on BCG projects and has a stakeholder network, so decision-makers designed the project based on the need of stakeholders.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	identify the procedure showing the bottom-up approach to set objectives.		<p>4- Mainly setting the objectives by a top-down approach with needs gathered from all target groups and stakeholders</p> <p>5- Objectives are set via working together from top-down and bottom-up approach.</p>		
2) Project rationality	<ul style="list-style-type: none"> - What is the project's rationale? - Does the project rationale align with the SDGs and NDCs related to the project? 	QL	<p>1- No relation between the project's rationale and the SDGs and NDCs</p> <p>2- Slightly related between the project's rationale and the SDGs and NDCs</p> <p>3- Moderately related</p> <p>4- Quite related</p> <p>5- Strongly related</p>	3	<p>1. The subproject aims to reduce the use of chemical pesticides and promote the use of safe microorganisms. The subproject would lead to sustainable green recovery of the Thai agricultural and food sector.</p> <p>2. The subproject would support SDGs 2, 3, 8, 9, and 12.</p> <p>3. However, the subproject does not support NDCs.</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
3) Defining the target groups (criteria of selection)	<ul style="list-style-type: none"> - What are the criteria used to identify the project's target groups? - How well are the criteria developed? - Whether the target groups appropriate in response to project objectives? - If any criteria, is the criteria ensure equity and inclusiveness? 	QL	<ul style="list-style-type: none"> 1- No criteria determined and not able to identify if the target group is appropriate 2- Some criteria but hardly defined to ensure that the target groups are appropriate 3- Fairly clear criteria and moderately ensure that the target groups are appropriate 4- Quite clear criteria, and most target groups are appropriate. 5- Strongly clear criteria and all target groups are appropriate 	4	<ul style="list-style-type: none"> 1. Given the Covid outbreak, the subproject targeted the locations within one day trip. 2. The targeted locations cover farm crops, perennial crops, vegetables, and herbs. 3. The subproject targeted the farmers interested in the use of microorganisms first and aimed at sustainable agricultural communities. 4. The subproject did not consider inequality reduction and inclusiveness in targeting. It focused on the creation of pilot communities and extension.
4) Output/ Outcome/ Impact to SDGs and NDCs	<ul style="list-style-type: none"> - How do the outputs and outcomes of the project address the 	QL	<ul style="list-style-type: none"> 1- No relation between the project's output/outcome 	3	<ul style="list-style-type: none"> 1) There are more produced microorganisms. 2) TISTR cooperated with the Department of Agriculture to promote microorganism usage.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	<ul style="list-style-type: none"> - impacts on related SDGs and NDCs? - Identify the SDGs and NDCs related to the project (i.e., Green Recovery, Environmental, Inequality reduction, and Inclusiveness). 		<ul style="list-style-type: none"> and the impacts on SDGs, NDCs, and BCG component 2- Slightly related between the project's output/outcome and the impacts on SDGs, NDCs, and BCG component 3- Moderately related 4- Quite related 5- Strongly related 		<ul style="list-style-type: none"> 3) Farmers can get free access to microorganisms and learn to culture and ferment them. 4) Small farms and disadvantaged farmers have access to microorganisms. 5) Outputs and outcomes are not related to NDCs.
5) Defining the project risk management process	<ul style="list-style-type: none"> - Are there any concerns about risks related to the project during the project design process? - Are there any expected risks or obstacles that will make the project unsuccessful? - Is there any risk prevention or management 	QL	<ul style="list-style-type: none"> 1- None of the risks and obstacles are determined, and management 2- Some risks or obstacles are determined but hardly defined and managed 3- Some risks or obstacles are fairly determined and managed 	3	Risk management in project design and process was limited to only the Covid-19 situation. Thus, the project chose to conduct extension activities in the nearby province within a one-day trip.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	<p>integrated into project design?</p> <p>*If any, identify the risk and obstacles to the project's achievement and the risk management process</p>		<p>4- Some risks or obstacles are well-determined and managed</p> <p>5- All risks and obstacles are well-defined and managed</p>		
3.2 Project Planning and Analysis					
6) The project's activity analysis	<ul style="list-style-type: none"> - What are the project activities? - Does the project activity cover the deliverables of the project's expected output/outcome? - How did SDGs and NDCs develop into activities or criteria to select counterparts in each activity? 	QL	<p>1- Not clearly defined the project activities</p> <p>2- Slightly clearly defined the project activities but did not cover the expected outputs/outcome</p> <p>3- Somewhat clearly defined and cover the project output and outcome</p> <p>4- Clearly define and cover the project output/outcome and related to the SDGs and NDCs.</p>	4	<p>1) Setting up the microorganism plant.</p> <p>2) Produce microorganism.</p> <p>3) Disseminate the knowledge and usage of microorganisms.</p> <p>4) Create a pilot fermenter machine for agricultural communities.</p> <p>5) Distribute the condensed or crystalized microorganism to the agricultural communities.</p> <p>6) SDGs and NDCs are not related to activities and criteria in selecting the counterparts for each activity.</p> <p>7) However, the activities' outcome should help achieve SDGs 2, 3, 8, 9, and 12.</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			5- Very clearly defined define and cover the project output/outcome and related to the SDGs and NDCs.		
7) Involvement of target groups/stakeholders in project planning and analysis.	<p>- Are the project's target group and stakeholders involved in the project planning and analysis?</p> <p>If any, identify the activity</p>		<p>1- No involvement</p> <p>2- Slightly involved and not cover all the target groups and stakeholders</p> <p>3- Moderately involved and not cover all the target groups and stakeholders</p> <p>4- Most of the target groups and stakeholders are involved</p> <p>5- All of the target groups and stakeholders are involved.</p>	3	The local Office of Agriculture selected potential farmers and agricultural communities to participate in the program and receive training on using the prototype fermenter and machine.
8) The project's technical analysis	- What are the project's resource requirements?	QL	1- No clearly define the project's	5	The project requires plant setup, machinery, and expertise from both Thailand and foreign countries. Thus, the project resources were

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	<ul style="list-style-type: none"> - Are the project's resources suitably related to the project's activities? - How were the project's resources obtained? 		<ul style="list-style-type: none"> resource requirements 2- Slightly clearly defined but not related to the project activities 3- Moderately clearly defined and partly related to the project activities 4- Quite clearly defined and mostly related to the project activities 5- Well-defined and all related to the project activities. 		sufficient and suitable for the project. However, the need for technical support from a foreign expert in setting up the plant led to the possibility of the project being delayed.
9) The project's project organization & structure	<ul style="list-style-type: none"> - How was the project's team formed? - If any, define the procedure 	QL	<ul style="list-style-type: none"> 1- No clearly define the project's organization & structure 2- Slightly clearly defined but not related to the project activities 3- Moderately clearly defined and partly 	5	TISTR has a local expert team capable of communicating with local partners not only limited to farmers, agricultural communities, and local government officers.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			<p>related to the project activities</p> <p>4- Quite clearly defined and mostly related to the project activities</p> <p>5- Well-defined and all related to the project activities.</p>		
10) The project's value-for-money analysis	<p>- Is there the project's value-for-money conducted?</p> <p>*Either qualitative or quantitative analysis is acceptable for evaluation.</p>	QL	<p>1- No analysis was conducted</p> <p>2- Some analysis but hardly established result</p> <p>3- Fairly conducted cost and benefit analysis, with positive results</p> <p>4- Quite-well conducted cost and benefit analysis, with positive results in some dimensions (i.e., economic, social, and environmental)</p>	4	<p>There has been a financial project evaluation since the inception of the project. The initial evaluation comes from the internal unit of TISTR. Later on, by the end of the project, TISTR employed an external auditor to reevaluate the project's cost and benefit again to ensure the value for money.</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			5- Well-conducted cost and benefit study, both economic and financial analysis with positive results in all dimension (economic, social and environmental)		
3.3 Project Implementation					
11) Produce the planned deliverables (percentage of achievement)	- Does the project achieve all the planned deliverables?	QL	1- None or Slight of the planned deliverables achieved (25% achievement or less) 2- Some of the planned deliverables were achieved (more than 25% achievement) but the 3- Most of the planned deliverables were	4	The subproject achieved almost all deliverables, including extension activities, dissemination of microorganisms and knowledge, and plant setup. There was a delay in the government procurement process; therefore, there was a delay in the microorganism production and delivery. However, TISTR could ramp up other production resources to meet the deliverables' requirements.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			<p>achieved (more than 50% achievement), and some activity indicators met the target</p> <p>4- Most of the planned deliverables were achieved (More than 75% achievement), and some activity indicators met the target</p> <p>5- All of the planned deliverables were achieved, and all activity indicators met the target</p>		
12) Implement the plan	<ul style="list-style-type: none"> - Does the project reach the target group? - Do all project activities reach all parts of the target group? 	QL	<ul style="list-style-type: none"> 1- Not meet the planned target group 2- Partly meet the planned target group, not achieve 	4	<ul style="list-style-type: none"> 1. The subproject reached the target farmers. 2. The subproject activities covered all parts of the target farmers. 3. The start of the new plant was not on schedule due to the delay in government procurement. The

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	- Are all project activities implemented as planned?		<p>the target indicators</p> <p>3- Mostly meet the planned target group and partly achieve the target indicators</p> <p>4- Mostly meet the planned target group and achieve the target indicators</p> <p>5- Well accomplished and reached all target indicators</p>		incidence led to the delay in reaching SMEs who would cooperate with TISTR to commercialize microorganism products.
13) Measure interim results attained	- Are participants and other key stakeholders satisfied with all aspects of the project? (Assess from the beneficiaries' perception)	QL	<p>1- No assessment of beneficiaries' satisfaction</p> <p>2- Project beneficiaries are slightly satisfied</p> <p>3- Project beneficiaries are moderately satisfied</p> <p>4- Project beneficiaries are</p>	4	The participating farmers suggested that using microorganisms and microbial is still more challenging than using the chemical counterpart. However, the developed TISTR microbial is easier to use than the previous version.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			quite highly satisfied 5- Project beneficiaries are highly satisfied		
14) Materials, information, and presentations are suitable for the target group	<ul style="list-style-type: none"> - How did the projects' materials and information present to the target group? - Are all materials, information, and presentations suitable for the target group? (Assess from the target groups' perception) 	QL	<ul style="list-style-type: none"> 1- No suitable and relevant at all 2- Hardly suitable and relevant 3- Fairly suitable and relevant 4- Quite suitable and relevant 5- Well-designed and communicated to the target group 	4	<ul style="list-style-type: none"> 1. Both agricultural officers and farmers received the information and package from the TISTR. The material covers knowledge dissemination, a machine, and a microorganism sample. 2. Using a stainless prototype fermenter requires high skill and time to monitor. Moreover, the customization of the stainless fermenter was quite costly.
15) The problems and obstacles in the project management process	<ul style="list-style-type: none"> - What are the problems and obstacles in project management? - If any, define the problem and problem-solving process 	QL	<ul style="list-style-type: none"> 1- None of the problems was solved 2- Slight problems were solved, and most still are obstacles to the project's achievement 3- Some problems are solved and the 	4	<ul style="list-style-type: none"> 1) The prototype fermenter is hard to use and has a higher cost to produce than receiving free microorganisms. Then, TISTR must adjust the fermenter to be plastic at a lower cost. However, the cultivation of microorganisms is still tedious. 2) Given the cross-province traveling ban, the dissemination of knowledge was limited. However, TISTR experts thoroughly used its network capacity to complete the project process and evaluation.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			<p>project can be proceeded, but did not produce the expected outputs</p> <p>4- Most problems are solved, and the project can be proceeded and produce the expected outputs</p> <p>5- All problems are solved, and the project can be proceeded, produce the expected outputs, and monitor the process as a lesson learned for the future</p>		3) The delay in plant factory setup stems from the slow government procurement. However, TISTR could maneuver its resources to achieve the project outcomes.
3.4 Overall Output evaluation: measure the immediate effect of the program and is aligned with the project objectives.					
16) Project's output	<ul style="list-style-type: none"> - How well has the project achieved its objectives (and sub-objectives)? - Identify the achieved outputs 	QT/QL	<p>1- None of the output achieved</p> <p>2- the project was partly achieved (less than 40% achievement)</p>	5	<p>1) The subproject could produce five microorganism strains suitable for each agricultural product and area.</p> <p>2) 2. There were more than 50 farmers who had gone through knowledge dissemination and extension activities.</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			3- the project was partly achieved (less than 41%-60% achievement) 4- the project was mostly achieved (less than 61%-80% achievement) 5- All objectives are achieved (more than 80% achievement)		
17) Achievement of project objectives	<ul style="list-style-type: none"> - Do all project objectives and indicators meet the targets? - Identify the indicators which meet the targets and do not meet the targets 	QT	1- None or slight of the indicators meet the target (Less than 20% achievement) 2- 21%- 40% achievement 3- 41-60% achievement 4- 62-80% achievement 5- All indicators meet the targets (more than 80% achievement)	5	The subproject had achieved all of its objectives. However, the delay in plant setup limited the further extension of microorganism usage and the corporation with agricultural companies to produce and supply microorganisms to the market. Also, the travel ban led to slower dissemination of knowledge and limited extension activities.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
3.5 Outcome evaluation: concerned with the long-term effects of the program and is generally used to measure the program goal. Consequently, outcome evaluation measures how well the program goal has been achieved.					
18) Measure the achievement of the overall goals	<ul style="list-style-type: none"> - Have the overall program goals been achieved? - Identify the goals which meet the targets and do not meet the targets. - Identify visible results or changes arising from the project 	QT	<ul style="list-style-type: none"> 1- None or slight of the goals achieved (less than 20% achievement) 2- 21%-40% achievement 3- 41%– 60% achievement 4- 61%-80% achievement 5- All goals achieved (more than 80% achievement) 	5	Farmers have realized the significance of using microorganisms and understand the safety of using microorganisms to enhance both the production and value of the product. Moreover, the use of microorganisms promoted the health of farmers who consume their products and reduced the abuse of chemical inputs. Also, farmers could get free condensed or crystalized microorganisms for future cultivation and usage.
3.6 Specific Indicators (Project-based indicators)					
Environment impacts					
19.1) By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed	Number of farmers participating in BCG technology transfer activities from this project (QT)	QT/QL	<ul style="list-style-type: none"> 1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts 	3	Fifty farmers were trained under this project. However, it is expected that these farmers can transfer knowledge and technology to other farmers.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
<p>international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment. SDG 12.4</p>					
<p>19.2) By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment. SDG 12.4</p>	<p>Chemical used reduction (percentage) (QT)</p>	<p>QT/QL</p>	<p>1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts</p>	<p>3</p>	<p>Most farmers under the subproject use both microorganism products and chemical products. Therefore, chemical use reduction might not change too much, leading to moderate impacts. In addition, most farmers who use only microorganism products have health problems from using chemical products. From the interview, using microorganism inputs to replace chemical products reduced farmers' health problems.</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
Note: In addition, this issue can also satisfy SDG 3.9 (By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination).					
Economic impacts					
19.3) By 2030, double the agricultural productivity and incomes of small-scale food producers. SDG 2.3	Average monetary benefit from BCG technology transfer from this project (QT)	QT/QL	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	4	From the evaluation of TISTR, the project incurs a net present value equal to 92 million baht for the next five years.
19.4) By 2030, double the agricultural productivity and incomes of small-scale food producers. SDG 2.3	Percentage reduction of each product cost resulting from the project (QT)*	QT/QL	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	5	- Under the subproject, TISTR distributes microorganism products to farmers without any costs. Therefore, this helped the farmer to save their costs. - TISTR can sell microorganism products at a price less than the market price by 30%. Therefore, this would help farmers to access microorganism products in the future.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
19.5) By 2030, double the agricultural productivity and incomes of small-scale food producers. SDG 2.3	Products come from the project, pieces, and their prices (QT)*	QT/QL	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	4	The machine can produce five microorganism products that cover an area of around 476,000 – 585,000 rai.
19.6) By 2030, double the agricultural productivity and incomes of small-scale food producers. SDG 2.3	Market prices of the new input (QT)*	QT/QL	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	5	TISTR sold microorganism products at a price less than the market price by 30%. Therefore, this would help farmers to access microorganism products.
19.7) Achieve higher levels of economic productivity through diversification, technological upgrading, and innovation. SDG 8.2	Number of individuals who apply new technology (QT)	QT	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	3	Most of the trained farmers under the subproject are familiar with microorganism products. The new machines made farmers more comfortable and convenient when using microorganism products.
19.8) Achieve higher levels of economic productivity through diversification, technological upgrading, and innovation.	Value-added from the new technology of finished goods (QT)	QT/QL	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	2	The price premium of organic products is around 15% - 50% of the traditional product, depending on product type. However, under the project, most farms are not organic. Thus, farmers use microorganisms and chemical products on their lands and do not get a price premium for organic products.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
SDG 8.2					
19.9) Support domestic technology development, research, and innovation. SDG 9. b	Import substitution values of the machine, raw materials, and disposable materials in this project (QT)	QT/QL	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	4	<ul style="list-style-type: none"> - Microorganism products can substitute chemical products imported from abroad. However, the number of farmers using microorganism products distributed by the project is a small percentage compared to the total number of farmers. - The machine used to produce microorganism products was imported from France. The total cost of the machine and installation is around 100 million baht.
3.7 Overall Impact Evaluation:					
20) Measure the project's overall impacts on the progress of SDGs Note: Evaluating from the <i>Specific Indicators</i> or project-level indicators.	- How well does the output/outcome of the project achieve the progress of the SDGs, NDCs, and BCG components?	QL	1- None of the output/outcomes achieving progress on the SDGs 2- Slightly achieving 3- Moderately achieving 4- Much achieving 5- A great deal in achieving	3	The subproject affected the achievement of SDGs moderately. However, it would enhance the chance of getting greener consumption and production in the future.
21) Measure the project's overall impacts on the progress of NDCs	- How well does the output/outcome of the project achieve the progress of the	QL	1- None of the output/outcomes achieving progress on the NDCs 2- Slightly achieving	3	Most of the allocated budget for plant setup is not related to NDCs. However, the smaller subprojects are slightly related to NDCs, such as using less energy and circular production.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
Note: Evaluating from the <i>Specific Indicators</i> or project-level indicators.	SDGs, NDCs, and BCG components?		3- Moderately achieving 4- Much achieving 5- A great deal in achieving		
3.8 Sustainability: Continuity of the benefits and impacts. The extent to which the net benefits of the intervention continue or are likely to continue.					
22) The project's net benefits of the intervention continue or are likely to continue	- Will the outputs last?		1 Absolutely not. 2 Maybe not 3 Not sure / unclear 4 Very likely 5 Definitely possible	4	The machine, producing microorganism products, lasts more than 15 years. There are only variable costs to produce and distribute microorganisms to farmers and sustain the project's objective. Moreover, from site visits, farmers can quickly contact and get microorganism products from TISTR.
23) The project's flow of net benefits or the likelihood of net benefits continuing to deliver the outcomes and impacts over the medium and long-term.	- Will the outcomes have potential to deliver in the long term -		1 Absolutely not. 2 Maybe not 3 Not sure / unclear 4 Very likely 5 Definitely possible	4	Farmers who adopt microorganism products are expected to continue to use them. The prolonged period of using microorganisms will need less use of microorganisms in the field since microorganisms can reproduce. Moreover, the farmer will be healthier than those who use chemical products.
3.9 Cost-Benefits Analysis on making project greener and more inclusive					
24) Estimate the benefit and cost to make	- Does the benefit outweigh the cost to	QL	1- Absolutely not. 2- Maybe not	5	The fixed cost has been deemed sunk. Therefore, expanding the project to support

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
<p>the project greener or more inclusive</p> <p>Note: Environment (greener) /social (inequality & gender) / economic (income generation & employment)</p>	make the project greener and more inclusive?		<p>3- Not sure / unclear</p> <p>4- Very likely</p> <p>5- Definitely possible</p>		green recovery and be more inclusive would incur an infinitesimal marginal cost. Thus, the benefit would further outweigh the cost.

Remark:

* QT = Quantitative Indicators and QL = Qualitative Indicators.

3.2 MCDA Results and Discussion

The Table and graph summarize the MCDA results in different dimensions as follows.

Table IV(a) MCDA’s Result—BCG

Evaluation Criteria		Weight	Total Score	BCG
RELEVANCE/ COHERENCE	Project Design/Planning	20%	100	76.00
EFFICIENCY	Project Implementation	20%	100	80.00
EFFECTIVENESS	Overall Output / Outcome	20%	100	100.00
IMPACT	Impacts on SDGs and NDC	20%	100	53.57
SUSTAINABILITY	Continuity of the benefits and impacts	20%	100	80.00
OVERALL EVALUATION		100%	500	389.57

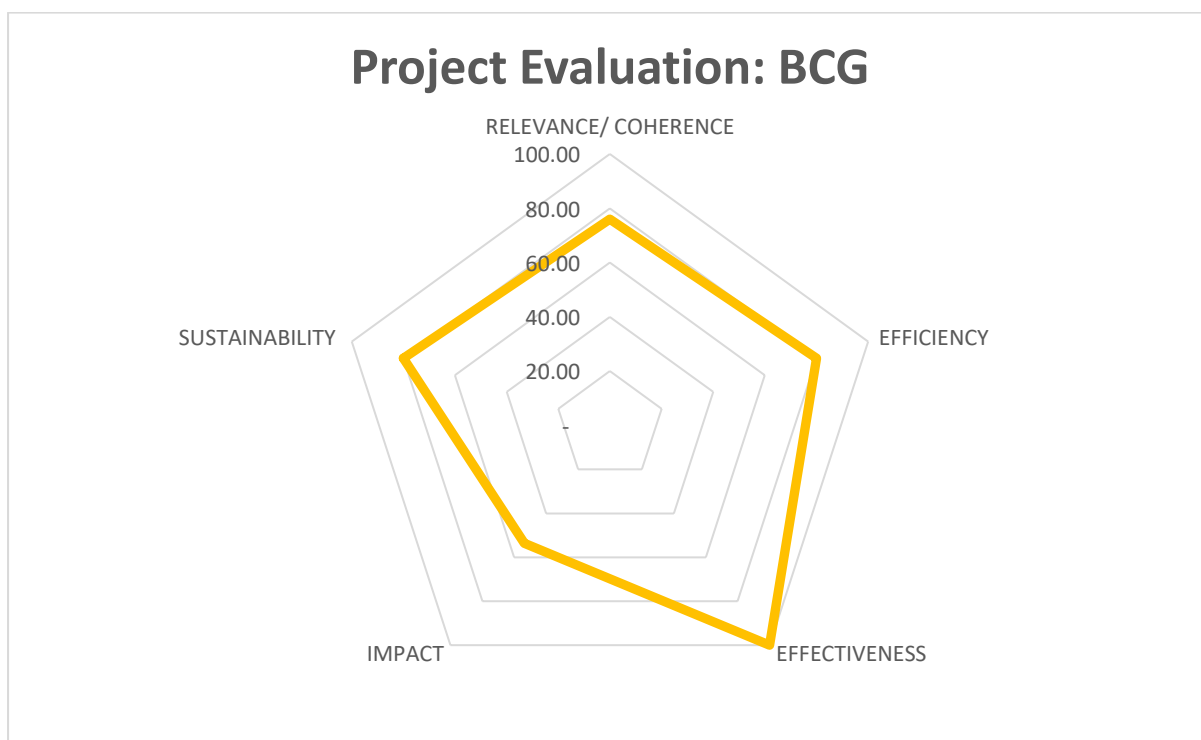


Figure IV(c) Project Evaluation—BCG

3.2.2 Discussion

The BCG project scores highly in almost all aspects of project evaluation. The highest score is on its effectiveness, followed by the lowest on the project's impact. The scores for every dimension exceed fifty percent. The high relevance and effectiveness scores come from the selection criteria of the participating farmers. They can adopt microorganisms since they currently use them to grow their crops or plan to adopt them soon.

Moreover, they strongly tie in with the local government office or TISTR. They have participated actively in TISTR or the local office's previous agricultural activities. Moreover, the farmers received or knew how to ask for free microorganisms from the local agricultural office or TISTR. In addition, the participating farmers not only know how to use and cultivate microorganisms by themselves but also learn how to mix both chemical pesticides with supplement microorganisms for insect and disease control.

1) **Relevance/Coherence**

The BCG subproject has had a robust and coherent design since its inception. Moreover, it had **well-defined processes and activities relevant to stakeholders and beneficiaries**. Its primary design focuses on green economic recovery and improving the environment after the Covid outbreak. Also, it directly links to global goals such as the Sustainable Development Goals (SDGs). It helps the beneficiary and stakeholder needs by reducing the cost of using microorganisms, reducing chemical uses, and improving farmers' health. However, the design did not involve NDCs in project goals and activities.

The project has internal coherence with the beneficiaries. The project's target group was farmers with experience or interest in using microorganisms. Moreover, the project process attracted farmers who wanted to experiment with microorganisms, who were either avid learners and early adopters or farmers with health problems caused by chemical usage.

The allocated budget is necessary and sufficient to build the microorganisms plant in the TISTR central location. The plant is the first in Thailand, with enough capacity to serve farmers and small and medium agricultural enterprises. However, the allocated budget is insufficient to conduct the extension and activities by both TISTR and local agricultural offices. Thus, they designed and implemented the activities by **exploiting the current network of relationships between government officials and farmers**. Thus, there was less participation from stakeholders in the project design. Also, an internal evaluation of the project's value for money pointed out the project's overall efficiency. However, the project risk management did not cover the COVID outbreak and government procurement delay. Thus, the project could not be as efficient in training the farmers since the traveling ban. Moreover, the government slowly procured the plant setup and foreign expert visas. Hence, the distribution of the first batch of produced microorganisms was delayed.

2) **Efficiency**

The project achieves a moderate efficiency level since it can deliver all planned deliverables; thus, the score is 75 percent. The project primarily meets the planned target group and achieves the target indicators. Project beneficiaries are quite highly satisfied, the

projects' materials and information quite suitable and relevant, and most problems are solved. The project can be proceeded and produce most of the expected outputs.

There are several lingering problems in scaling the use of microorganisms. The use of microorganisms, by itself, would be inefficient in the beneficiaries' view. Though the farmer received free microorganisms for both usage, fermentation, and cultivation, using concentrated microorganisms was less convenient than conventional chemical counterparts. For example, the farmer has to use more time and resources to cultivate microorganisms since it requires a specific stainless canister. TISTR checked on these inefficiencies and tried to improve them by designing and producing cheaper plastic canisters.



Figure IV(d) Stainless Canister and Plastic Canister

3) Effectiveness

The BCG project received a total score on the effectiveness of the project evaluation. The subproject could achieve every intended deliverable, including the number of trained farmers, the amount of distributed microorganisms, and the on-schedule plant setup. Moreover, if there were no Covid travel ban, the project could have a higher outcome than the project's plan.

4) Impacts

The project has a moderate to low impact on SDGs and NDCs. The main reason is that the project focused only on SDGs' economic and environmental impact. In addition, the environmental impact would be low, too. **The trained farmers did not have to substitute chemical substances with microorganisms wholly.** The farmer needs to have enough knowledge and perseverance if using only microorganisms. They must continuously monitor their fields and repeatedly apply microorganisms for crop protection. Then, most farmers use microorganisms and chemical products; thus, the project could not help reduce **chemical usage.**

For economic impact, TISTR's goals are to distribute the microorganisms and train the farmers for free. Thus, the economic impact from the farmers' perspective would be insignificant since they can receive the microorganisms for free and might not use them or use them along with their chemical counterparts. Thus, the project evaluation would solely focus on the project benefit from the TISTR perspective, and this would render the conduct of financial analysis on farm income moot. The main problems for a farmer not using microorganisms are as follows:

- 1) Lack of incentive to use microorganisms
 - a. Farmers who are land-renters (tenants) have less incentive to use microorganisms since the benefits of preserving soil quality are long-term benefits. However, tenants are more interested in short-run benefits than long-run benefits. Only longer the land-rent contract induces a higher incentive to use microorganisms.
 - b. Owners of the land who act as "managers" of the farm are not concerned about health problems when using chemical products. They do not directly have a negative health impact. On the other hand, farm employees perceive health problems but cannot decide whether to use chemical or microorganism products.

- 2) Inconvenience process of using microorganisms
 - a. There are many processes to prepare microorganisms; moreover, farmers cannot check whether microorganisms from their cultivation are enough for their land.

In this sense, microorganism products are less convenient to use compared to chemical products. By using microorganisms, farmers have to identify diseases/problems earlier and use microorganism products for a more extended period and more frequently. However, farmers can apply fewer microorganisms in the long term when the microorganism reproduces in the future.
 - b. Very few outlets sell microorganism products compared to chemical products.

- 3) Lack of knowledge about the long-term health impact
 - a. Farmers interested in short-term gain more than long-run impacts (high discount rate for intertemporal consumption)

- 4) Lack of market
 - a. The difficulty of getting organic certification
 - i. There will be a grace period where farmers have low income during the transition period.
 - ii. There are many processes to get certification since there are few organizations to certify.
 - b. Most interviewed farmers use microorganisms and chemical products to maintain crop yields. Therefore, the farmers do not receive the price premium for using microorganisms.

- c. c. When there is no certification, farmers get the same price for organic products as for traditional products, but using microorganisms has a higher implicit cost.

Given these limitations, the project's impact on SDGs would be moderate to low.

5) Sustainability

The project's sustainability comes from the paid sunk cost of the plant setup. However, the factory will remain in operation for the next fifteen years with a relatively low variable cost of producing microorganisms. Therefore, the free distribution of concentrated microorganisms would be more efficient, and the TISTR can work closely with a private partner to distribute the microorganisms efficiently. Moreover, with better technology, **the shelf life of TISTR's microorganisms would be higher than before and become more accessible for storage and transportation.** Also, the new plant could produce freeze-dried microorganisms with a year's shelf life. Thus, it would further enhance the distribution channel of TISTR's microorganism, and the farmer would have better product access.

In sum, the project evaluation pointed out the moderate impact of the project since farmers would keep using both chemical and microbial substances. Therefore, the environmental impact is limited. Moreover, only a tiny proportion of farmers use microorganisms entirely. Most of these farmers have health problems related to chemical usage.

4. Project's Value for Money

Evaluation of this subproject is under the principle of cost-benefit analysis, where the main goal is to assess the value of money from the project. The cost-benefit analysis hinges on the perspective of Thailand's macroeconomy via public expenditure and private benefits accrued over the life of the pilot plant. The assumptions on value for money, public expenditure, cost, and benefits are as follows.

4.1 Project Costs

The project cost comes from the fixed cost of 100 million baht for the pilot plant. However, since there was no budget for knowledge distribution, extension, and training of the farmers, TISTR has to use its ordinary budget to carry out such training and the Ministry of Agriculture network for their extension services. However, the variable cost for fermentation and cultivation of microorganisms is deemed low. In addition, from the interview with the TISTR officer, TISTR would sell microorganisms to the private sector at the point where revenue equals its costs since TISTR is a government and non-profit organization. Thus, by applying CBA with the incremental cost principle, there would be no variable cost of microorganisms in CBA calculation.

4.2 Project's Benefits

The benefits of this subproject have many dimensions, as follows.

The plant setup would increase production capacity and lead to better market access for farmers interested in using microorganisms.

- There would be factory-scale production of five microorganisms: *Beauveria bassiana*, *Metarhizium anisopliae*, *Trichoderma harzianum*, *Bacillus thuringiensis* (BT), and *Bacillus Subtilis* (BS). They are capable of being complementary to chemical pesticides.
- From TISTR training, farmers and local agriculture officers would better know how to use microorganisms on specific crops, including the usage amount and frequency of applications.
- Farmers will get cost reductions from acquiring free microorganisms. In addition, TISTR can help SMEs by selling the microorganisms at a price lower than the market price. From the interview, the discount was about 30 percent.
- If there were reduced chemical usage, soil quality would be better.
- Farmers would have better health from a reduction in the use of chemical products.

4.3 Assumption for CBA

The list of assumptions for CBA analysis is as follows.

- The benefits of the subject come from 1) Farmers can buy microorganisms at a reduced cost and 2) Farmers can reduce their healthcare costs stemming from using chemical products.
- The new pilot plant can produce microorganisms covering an area of 476,000 – 585,000 rai per year (Office of the National Economic and Social Development Council, 2022).
- The new machine has a product life of 10 years. (TISTR officer, personal interview, 21st July 2022)
- The farmers' cost of microorganisms per rai equals 93.21 baht. (Suwrat Siripin & Suneeporn Suwanmaneepong, 2020)
- TISTR supplies microorganisms at a price lower than the market by 30 percent. (TISTR officer, personal interview, 21st July 2022)
- The study assumes that for scaling the use of microorganisms, the farmers have to buy them at the given price.
- Thailand's total health care for treating patients from agricultural chemical usage is 14.64 million baht.²
- Thailand's total agricultural land area is 149,251,940.56 rai (Statistics of Land Utilization by Region and Province Year: 2011 - 2020, 2022).
- The discount rate is six percent.

² NHSO (2019) revealed information about patients under Universal Health Coverage in 2019, found more than 3 thousand cases of pesticide poisoning, 407 deaths, 2019

- Thailand's agricultural GDP was at 1.36 trillion baht in 2021. (NESDC 2022)
- The consultants interviewed farmers and conducted the focus group and found that the yield from crops remained unchanged since farmers would adjust the mixed use of both chemical substances and microorganisms. Thus, there are three classifications of the farmers as in the following tables.
- Farmer Classification.

	Before subproject	After Subproject	Classification
1	Farmers use only chemical products	Farmers use both chemical products and microorganisms. However, they might not need to change the usage of chemical products.	Complementary use with chemical product, or partially substitute chemical product.
2	Farmers use both chemical products and microorganisms.	Farmers still use both chemical products and microorganisms. However, they might substitute the old with the new ones.	Substitute or complementary to the previous type of microorganism, Complementary with a chemical product, or partially substitute chemical product.
3	Farmers use only microorganisms. (Organic farmers)	Farmers use old and new microorganisms.	Purely use microorganisms.

- Moreover, the consultants review the academic paper on the effectiveness of microorganisms on crop yield. Most academic studies focus on the effectiveness of microorganisms in reducing the number of insects and do not study the effect on yield (Popoonsak & Konkarn, 2022; Rajula et al., 2021; Thaochan et al., 2021; Rassami et al., 2020; Ratanacherdchai et al., 2019; Razkhanty & Klanginsirikul, 2017).
- Many factors can contribute to changes in crop yield at the farm level, ranging from water, disease, and farmers' management. Therefore, the farm-level study tries to avoid such confounding factors.
- However, there are limited studies in Thailand focusing on using microorganisms and crop yields in the experiment plot. (Junda et al., 2022; Sukleard et al., 2016; Sureewan Mekkamol et al., 2016)
- They found out that the effect of microorganisms on yield is not statically significant. These studies share standard features data on the specificity of

crops, times, and plots of land. Thus, there is no clear conclusion on whether microorganisms should affect yield.

- Thus, using CBA in this study will employ different scenarios in yield change.

4.4 Results

Scenario 1 represents the case where the farmer's yield does not change. Thus, if the TISTR can distribute microorganisms to the farmer with the expected land area of 467,000 rai per year for the next ten years, the project's net present value would be -1.69 million baht. However, if TISTR can expand the coverage area of 585,000 rai per year for the next ten years, the NPV would be 20.82 million baht. Thus, the breakeven point of the project hinges on adopting microorganisms. If the factory can cover 484,186 rai of land or 82.77 percent of plant capacity, the NPV of the project would be zero.

From sensitivity analysis, yield is one of the critical factors in the cost-benefit analysis; if microorganisms would boost the yield by ten percent, then NPV with 476,000 and 585,000 rai of land would equal 3.1 and 3.9 billion baht, respectively. Moreover, the number of breakeven coverage areas would be only 14,465 rai.

However, if the use of microorganisms would reduce the yield by ten percent, it would deem the project to have a negative value for money. The adoption of microorganisms would lead to a decline in revenue by 911.12 baht per rai per year. Given the savings from a lower microorganism cost of 27.96 rai per year and a healthcare cost of 0.098 baht per rai, it would not be enough to cover such a massive loss in revenue. Thus, the farmer's gross margin would be reduced while the other fixed costs would not change.

The sensitivity analysis of NPVs with varying yields is in the following Table. The yield varies from minus five percent to minus one percent, while on the positive side, it varies from positive one percent to positive five percent.

Table IV(b) NPV of BCG project (baht)

Scenario	Change in yield (percent)	NPV		Break-even area (rai)	Percent of the breakeven area of adoption to the total plant capacity coverage area
		Min (Adoption area = 476,000 rai)	Max (Adoption area = 585,000 rai)		
1	0	-1,690,740	20,821,255	484,186	82.77
2	10	3,190,757,275	3,944,313,037	14,465	2.47
3	5	1,594,533,268	1,982,567,146	28,090	4.80
4	1	317,554,062	413,170,433	113,997	19.49
5	-10	-3,194,138,755	-3,902,670,528		
6	-5	-1,597,914,747	-1,940,924,637		
7	-1	-320,935,541	-371,527,924		

From the Table, any reduction in yield would make the microorganism plant unable to break even in ten years. This calculation assumes a flat-rate yield reduction for each year; however, if such a situation persists, the interviewed farmers said that they would adjust the combination for the use of both chemical products and microorganisms to at least maintain the crop yield. There are limitations to this CBA, especially on the benefits side. The study does not include the environmental benefits of using microorganisms. Moreover, healthcare cost savings would be low. The benefit does not count the underreported cases of sickness from using chemical products. That is, the unwell farmer would not go to the hospital and get treatment from the doctor. The healthcare cost benefit does not cover the cost of buying medicines and travel costs to the hospital. Also, it does not cover hospital costs outside the Universal Health Coverage. Also, the cost does not cover the case of dead farmers from chemical usage.

Moreover, the CBA did not consider the price premium from organic products since it is business as usual. Lastly, the consultant compares the NPV from the external evaluator hired by TISTR. The University of the Thai Chamber of Commerce (UTCC) team found that the NPV of the project equaled 92 million baht (TISTR officer, personal interview, 10th August 22).

5. Project Overall Assessment and Lessons Learned

5.1 Strengths

- TISTR has well-equipped facilities and capable staff for researching and developing microorganisms and knowledge management.
- TISTR has continuously developed microorganisms and distributed them to the public. Moreover, it takes feedback from the user to calibrate and experiment on the new and effective strain and improve the ease of use for microorganisms.
- The operation of the microorganisms subproject integrates and involves a robust network of stakeholders. The project covers local communities, TISTR, and local agricultural offices. TISTR always works with local extension officers to solve farmers' microorganism problems. TISTR officers create Line Groups with farmers and extension officers to facilitate communication between each group and be responsive to the pending problems regarding using microorganisms to quell diseases, pests, and insects.
- TISTR provides a vibrant communication and solution for the participating farmers to reduce chemical use that negatively impacts their health and the environment and ensure continuous improvement in stakeholder microorganism usage.

5.2 Weaknesses

- Farmers have to prepare the required amount of microorganisms by themselves. They have to culture and store the required amount by themselves. Hence, by design, they are less convenient compared to their chemical counterparts.
- Using microorganisms as pesticides requires more time and care from the farmers than chemical products. That is, microorganisms take more usage time

before their effect is comparable to their chemical counterparts. Thus, farmers have to visit their farms frequently and persistently check up on each plot of land so they can detect the types of disease or pests early.

- Farmers must build up their capacity regarding knowledge and skill in using microorganisms. They must correctly detect the problems and apply the right type and amount of microorganisms at the right time and frequency.

There are three lessons learned from the strengths and weaknesses of the subproject. The project strengths come from the design and timing of project implementation, which is suitable for the plant and its seasonal conditions in Thailand. TISTR and farmers have sufficient time to improve farm conditions and the right microorganism tools. Secondly, TISTR involves more authority throughout project planning and implementation at almost every level of operation. It plans to sign an MOU for microorganism distribution and cooperate with the business sector in distribution and knowledge management. Lastly, TISTR, with a limited budget, still tries to incorporate more capacity building for farmers, especially co-designing the microorganism tool and training sustainable farming to increase adoption. TISTR aims to gear farmers toward sufficient income through a combination of better-quality crops and produce.

6. Project-Based Recommendations

6.1 Process improvement: participatory process/decentralization towards a geography-based approach

- The project should include risk management on government procurement for future procurement.
- The initial focus on active and knowledgeable farmers would be critical for further recruitment for project extensions. Then, the knowledge should extend to recognizing the long-term benefits of using microorganisms since they entail lower health risks and are beneficial for the surroundings.
- The use of social media for project follow-up and recalibration of tools and machines should be in the project design and process to make the project more inclusive and greener.

6.2 Capacity building

- The capacity building to enhance the sustainability of greener produce and crops should incorporate the ability to create and match the market. For example, encouraging farming communities to promote green products would enhance their presence and get better market access. The promotional effort via the stakeholders' network would increase the chance of getting a higher price while reducing the use of chemical pesticides. In return, the farmer would adopt more microorganism usage and avoid improper use of chemical substances.

- Project training could integrate SDGs and NDCs in disseminating training to more stakeholders to use chemicals and microorganisms properly. This would allow stakeholders to maintain yields and be environmentally friendly.
- The extension services should enhance all stakeholders' knowledge of chemicals and microorganisms and provide technical support for greener and safer agricultural practices for farmers.

6.3 Transformative partnerships: collective actions of the government, private sector, civil society, and individuals

- Budgeting and collaboration with local agriculture officials should be necessary for making the project more inclusive and achieving greener outcomes.
- TISTR and related agencies could plan to set up a market for reduced-chemical agricultural products. The promotional effort should convey the message of positive externalities from chemical reduction: better farmers' health and a better environment.
- The extension services should engage both private enterprises and academic institutions. Engaging these two parties would enhance the usage of the pilot plant and use it to its total capacity. The cooperation would further enhance research and development and the supply of microorganisms in the market, increasing the accessibility of microorganisms.

6.4 Research and innovation: towards BCG model

- The development of microorganisms as an integral part of the BCG model should not be one size fits all. It requires both information regarding local demand and spatial needs. The heterogeneous nature of the adoption context should be integral in making the project more inclusive and effectively greener. Moreover, the research and development of microorganisms are changing and must continuously improve to catch up with the new outbreaks and pest management.

6.5 Financial sustainability, such as green lending and investment

The project should incorporate the design of 4-5 years with continuing extension support for existing target groups while coordinating the budget among relevant agencies within the Ministry of Agriculture and Ministry of Higher Education, Science, Research, and Innovation.

6.6 Matrix checklist for policy recommendations

	Relevance & coherence	Efficiency	Effectiveness	Impacts	Sustainability
Process improvement	/			/	/
Capacity building	/			/	/

	Relevance & coherence	Efficiency	Effectiveness	Impacts	Sustainability
Transformative partnerships	/			/	/
Research and innovation					
Financial sustainability	/				/
Legislative					
Others					

References:

- Gross Domestic Product*. (2022). Office of the National Economic and Social Development Council. https://www.nesdc.go.th/main.php?filename=qgdp_page
- Junda, V., Tugkananuruk, K., & Amnuaykanjanasin, A. (2022). Biological control agents as alternative of chemical insecticides in melon greenhouse. *Khon Kaen Agriculture Journal*, 50(6), 1683–1690. <https://doi.org/10.14456/kaj.2022.137>
- Office of the National Economic and Social Development Council. (2022). *Upgrading the economy in the Central-Western Economic Corridor using the BCG model*. EMENSCR. <https://emenscr.nesdc.go.th/thaime/loanact/view.html?id=83eqVZKBgWSOwOn5VlZl>
- Popoonsak, S., & Konkarn, M. (2022). Efficacy test of some Entomopathogenic fungi to control *Aphis craccivora* (Koch) in yard—Long bean. *Thai Agricultural Research Journal*, 39(2), 159–167.
- Rajula, J., Pittarate, S., Suwannarach, N., Kumla, J., Ptaszynska, A. A., Thungrabeab, M., Mekchay, S., & Krutmuang, P. (2021). Evaluation of Native Entomopathogenic Fungi for the Control of Fall Armyworm (*Spodoptera frugiperda*) in Thailand: A Sustainable Way for Eco-Friendly Agriculture. *Journal of Fungi*, 7(12), Article 12. <https://doi.org/10.3390/jof7121073>
- Rassami, W., Bunroj1, A., Ormking, C., & Iamjitkusol, S. (2020). Study on Integrated Insect Pest Management in Pesticide Residue Free Crop in Khao Khitchakut District, Chathaburi Province. *Rajabhat Rambhai Barni Research Journal*, 14(1), Article 1.
- Ratanacherdchai, K., Chaiyarak, T., & Juntachum, N. (2019). Efficacy of *Beauveria bassiana* Against Tobacco Whitefly and Brown Planthopper. *Prawarun Agr. J.*, 16(2), Article 2. <https://doi.org/10.14456/paj.2019.17>
- Razkhanty, K., & Klangsinrikul, S. (2017). Screening of Potential Insect Pathogenic Fungi for Controlling Cabbage Aphid (*Lipaphis erysimi*). *King Mongkut's Agricultural Journal*, 35(2), 65–75.
- Revealing information about patients under Universal Health Coverage in 2019, found more than 3 thousand cases of pesticide poisoning, 407 deaths*. (2019, August 5). Hfocus.org. <http://www.hfocus.org/content/2019/08/17468>
- Statistics of Land Utilization by Region and Province Year: 2011—2020*. (2022). National Statistical Office. <http://statbbi.nso.go.th/staticreport/page/sector/th/11.aspx>
- Sukleard, N., Kulsarin, J., Buranapanichpan, S., & Pongprasert, W. (2016). Efficacy of Fungal Bioinsecticides on Striped Flea Beetle Control in Baby Pak Choi in Highland of Chiang Mai Province. *Journal of Agriculture*, 32(2), Article 2.
- Sureewan Mekkamol, Kanjana Wichittrakulthavorn, & Renu Suwanpornskul. (2016). Effects of Potassium Silicate in Controlling Powdery Mildew and Downy Mildew of Japanese

Cucumber under Plastic House and Farmer's Field Conditions. *Journal of Agriculture*, 32(1), Article 1.

Suwarat Siripin, & Suneeporn Suwanmaneepong. (2020). *Cost and Return of Rice Production among Farmers Using Biopharmaceuticals under the Ban Khok Chang Community Pest Management Center, Leam Bua Sub-District, Nakhon Chai Si District, Nakhon Pathom Province* [Data set]. Kasetsart University.
<https://doi.org/10.14457/KU.RES.2020.260>

Thaochan, N., Ngampongsai, A., Prabhakar, C. S., & Hu, Q. (2021). *Beauveria bassiana* PSUB01 simultaneously displays biocontrol activity against *Lipaphis erysimi* (Kalt.) (Hemiptera: Aphididae) and promotes plant growth in Chinese kale under hydroponic growing conditions. *Biocontrol Science and Technology*, 31(10), 997–1015. <https://doi.org/10.1080/09583157.2021.1917512>

TISTR officer. (21st July 2022). *Upgrading the economy in the Central-Western Economic Corridor using the BCG model* [Personal Interview].

TISTR officer. (10th August 2022). *Upgrading the economy in the Central-Western Economic Corridor using the BCG model* [Personal Interview].

V. Project Evaluation Report -- Cotton Valley Creation

1. Project Background/Attributes

1.1 Responsible Agency

The Loei Provincial Industry Office / Ministry of Industry

1.2 Descriptions

The twenty-year national strategy has established a strategy for building competitiveness. In the Twelfth National Economic and Social Development Plan, the development of the economic foundation in Strategy 2, building justice and reducing inequality in society, set the goal to increase the community's well-being and the financial foundation. In Strategy 9, the development of the city and the economic region aims to reduce the income gap and distribute the income fairly, which develops the local economy. To achieve this goal, there is a mechanism for promoting the economic level of local communities to be strong and self-reliant during the COVID-19 pandemic, which affects health and the world economy. The COVID-19 pandemic brings about potential economic recession and slows the industrial sector. Preventive measures during COVID-19 have widely impacted the economy in most industrial sectors. Among those heavily affected in Thailand were the retail and tourism business and other related businesses. Thai government on March 10th and 24th, 2020, approved budgets and measures to mitigate the effects of COVID-19 on the Thai economy, both directly and indirectly, including financial measures, taxation, income compensation, and knowledge enhancement.

The Loei Provincial Industry Office, as an agency under the Ministry of Industry, is responsible for promoting and supporting the development of the industrial sector. As a result of the pandemic, whose impact is severe, there is an urgent need to speed up the recovery of the economy, along with the development plan set to enhance the agricultural sector. Cotton is a local identity of Loei province that has been cultivated for a long time. Thus, the Cotton Valley Creation Project has been proposed to develop the cotton industry in Loei Province, where cotton products are made from a combination of raw materials, traditional lifestyle, local wisdom, and unique culture and are in the market need both domestic and potentially international. The project connects the tourism industry and will bring income from the production of goods and tourism in Loei Province. The project also stimulates economic activities of the provinces along the supply chain, covering the promotion of non-toxic cotton plantations, the sustainable production of cotton threads, the processing of cotton products, promoting cotton products' new and innovative knowledge, and promoting travel in Loei Province.

1.3 Project Activities

- 1) The Loei Provincial Industry Office secured a budget for the project.
- 2) Growing non-toxic cotton fields for 100 Rai in 9 villages.
- 3) Seminar/training of the Cotton Valley Creation for 150 participants from 9 villages.
Seminar course: 3 days
Seminar Topics: Development needs survey, efficient stock management, linkage to secure funding, sale promotion, new product development
- 4) Consultation/advisory for 150 participants on value value-added products.
- 5) Development of 50 prototype cotton products.
- 6) Activities were connected to tourism in Loei Province.
- 7) Marketing activities and presentation of prototype products and public relations

1.4 Project Status

Project scheduled completion date: 30 September 2021

Status: completed (Confirmed)

Total budget: 16.5 million baht

1.5 Project objectives: Cotton Valley Creation has three main objectives.

- 1) To promote and develop identity and knowledge in cotton handicraft production from local wisdom and raw materials as well as a linkage to the tourism of Loei Province.
- 2) To create internationally bounded value-added cotton handicraft products.
- 3) To create jobs and income for people in Loei Province.

1.6 Target Group: SME communities and cotton farmers

1.7 Geography: Loei Province

1.8 Outputs: Cotton Valley Creation has established four outputs.

- 1) A total of 150 trained and educated entrepreneurs.
- 2) A total of 50 prototype products.
- 3) A total of 9 tourism landmarks (with areas of 100 Rai overall).
- 4) A total of 200 job employments

1.9 Outcomes: Five outcomes could be identified from Cotton Valley Creation.

- 1) Export market expansion.
- 2) Increase value-added products based on local culture, wisdom, and identity that meet market needs.
- 3) Job and income creation lead to self-reliance.
- 4) Linkage to the tourism industry.
- 5) Economic stimulation in Loei Province.

2. Project Site Visits:

Project Site	Date/Time	List of Informants
Province/ District/ Subdistrict		Farmers Project Beneficiaries Local Authorities responsible for the project
Loei Provincial Industrial Office, Kut Pong Subdistrict, Mueang Loei District, Loei Province	26 September 2565 Time 13.00 -16.30	Local Authorities responsible for the project
Ban Na Pa Nad, Khao Kaew Subdistrict, Chiang Khan District	26 September 2565 Time 17.00 -18.00	Group of Farmers Group of Project Beneficiaries
Ban Sam Kham, Pha In Plaeng Subdistrict, Erawan District, Loei Province	27 September 2565 Time 09.00 -12.00	Group of Farmers Group of Project Beneficiaries
Ban Kang Pla, Chaiyapruerk Subdistrict, Mueang District, Loei Province	27 September 2565 Time 09.00 -12.00	Group of Farmers Group of Project Beneficiaries
Ban Kok Bok, Nong Ngu Sub-district, Wang Saphung District. Loei Province	27 September 2565 Time 13.00 -14.00	Group of Farmers Group of Project Beneficiaries

3. Multi-Criteria Decision Analysis (MCDA)

3.1 The set of evaluation criteria for the Cotton Valley Creation

The set of evaluation criteria emphasizes the project cycle process of project design, planning, and implementation as well as the output, outcome, and impacts on SCGs, NDCs, and BCG components to learn that the project has been well developed to achieve their goals and objectives and evaluate how it impacts on the sustainability and green recovery.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
3.1.1 Project Design					
1) Identifying project target group needs in setting objectives	<ul style="list-style-type: none"> - How was the project designed with its objectives? - Are there any forms of need analysis or supported information to set the project objectives? <p>* Identifying the evidence showing the target groups and stakeholders' involvement in project design and setting its objects process.</p>	QL	<ul style="list-style-type: none"> 1- No evidence identifying procedure to define the project needs before setting the project objectives. 2- Mainly setting the objectives by using a top-down approach, slightly bottom-up to get the needs of the target group, 3- Mainly setting the objectives by using top-down, have some needs gathered from the target group 	3	<p>The objectives of the project were determined based on the economic recovery plan of Loei Province from the impact of the coronavirus disease 2019 epidemic., The Loei Provincial Industrial Office had a desire and decided to restore the economy using local identity and cultural heritage from the cotton cultivation and cotton weaving that are unique to the area by upgrading the cotton farming/industry products to have more value-added along with tourism promotion.</p> <p>Selection of project target groups was based on selected groups of local SME with potential and readiness to build on their careers immediately and be able to continue on their own at the end of the project.</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	In the case of using the bottom-up approach, identify the procedure showing the bottom-up approach to set objectives.		<p>4- Mainly setting the objectives by a top-down approach with needs gathered from all target groups and stakeholders</p> <p>5- Objectives are set by working together from top-down and bottom-up approaches.</p>		
2) Project rationality	<ul style="list-style-type: none"> - What is the project's rationale? - Does the project rationale align with the SDGs and NDCs related to the project? 	QL	<p>1- No relation between the project's rationale and the SDGs and NDCs</p> <p>2- Slightly related between the project's rationale and the SDGs and NDCs</p> <p>3- Moderately related</p> <p>4- Quite related</p> <p>5- Strongly related</p>	3	The coronavirus disease in 2019 is a severe epidemic that is strongly affecting the economy. Therefore, the restoration of the local economy is urgent. As for Loei, the provincial development plan emphasizes the promotion of the agricultural sector. Cotton is a local heritage of Loei province that has been cultivated for a long time. Cotton products are the results of local wisdom and raw materials, including the unique culture of Loei Province, and help promote the province's economic activities throughout the supply chain, starting from the promotion of non-toxic cotton cultivation and cotton yarn production to finished cotton products and promotion of cotton products export

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
					internationally using new knowledge and innovations. The project rationale aligns with the SDGs and NDCs. The project implementation was consistent with Sustainable Development Goals 5, 8, 11, and 12.
3) Defining the target groups (criteria of selection)	<ul style="list-style-type: none"> - What are the criteria used to identify the project's target groups? - How well are the criteria developed? - Whether the target groups appropriate in response to project objectives? - If any criteria, is the criteria ensure equity and inclusiveness? 	QL	<ul style="list-style-type: none"> 1- No criteria determined and not able to identify if the target group is appropriate 2- Some criteria but hardly defined to ensure that the target groups are appropriate 3- Fairly clear criteria and moderately ensure that the target groups are appropriate 4- Quite clear criteria, and most target groups are appropriate. 5- Strongly clear criteria and all 	3	The selection of target groups for the project was based on previous activities and records of each group of community enterprises. The high potential groups were selected to be pilot groups and network leaders. From the selection, these potential target groups can carry out the project's activities and achieve the project's objectives.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			target groups are appropriate		
4) Output/ Outcome/ Impact to SDGs and NDCs	<ul style="list-style-type: none"> - How do the outputs and outcomes of the project address the impacts on related SDGs and NDCs? - Identify the SDGs and NDCs related to the project (i.e., Green Recovery, Environmental, Inequality reduction, and Inclusiveness). 	QL	<ul style="list-style-type: none"> 1- No relation between the project's output/outcome and the impacts on SDGs, NDCs, and BCG component 2- Slightly related between the project's output/outcome and the impacts on SDGs, NDCs, and BCG component 3- Moderately related 4- Quite related 5- Strongly related 	4	<p>Project outputs and outcomes address the impact on the Sustainable Development Goals and GHG reduction targets.</p> <p><u>Environment</u> SDG 12.4.2 (a). In cotton farming promotion activities, cotton cultivation is chemical free. In making cotton products, it was encouraged to use natural colors without the use of chemical dyes to dye the cotton.</p> <p><u>Economy</u> SDG 1. Project implementation aims to create jobs, build careers and income for people in the area. SDG 8.3.1. During the implementation of the project, there was an increase in employment in the agricultural sector, especially the workers in the cotton fields as well as employment in the weaving process, such as hiring to make yarn from cotton wool.</p> <p><u>Society</u> SDG 11.4.1. The budget that came down to the project has promoted more interest in cotton planting. In some community enterprises, such as the Ban Kok Bok Weaving Group Ban, Na Pa Nad</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
					Weaving Group, and Ban Sam Kham Weaving Group, an increasing interest in cotton planting has led to more members of cotton farmers. and more members of the weaving group. SDG 5.5.2. In each community enterprise, a group leader is woman and most of the members are women whose roles are important in driving the project successfully at the local level.
5) Defining the project risk management process	<ul style="list-style-type: none"> - Is there any concern about risks related to the project in the project design process? - Are there any expected risks or obstacles that will make the project unsuccessful? - Is there any risk prevention or management integrated into project design? <p>*If any, identify the risk and obstacles to the project's</p>	QL	<ul style="list-style-type: none"> 1- None of the risks and obstacles are determined, and management 2- Some risks or obstacles are determined but hardly defined and managed 3- Some risks or obstacles are fairly determined and managed 4- Some risks or obstacles are well-determined and managed 5- All risks and obstacles are well- 	3	<p>In the project design process, business risks were considered. Complaints about the selection of the project's target groups have also arisen. In this regard, it was clarified that due to the limited project implementation time, it was necessary to select potential target groups who are ready first.</p> <p>The expected risks that could affect the project's success, such as the 2019 coronavirus pandemic situation, indeed made the situation difficult to carry out activities that require group work (no people gathering were allowed during the midst of the crisis). A delayed budget approval also resulted in the lack of continuity in the operation of the project</p> <p>There was a risk management approach that depended on the plan's implementation and flexible adjustments according to the situation within a specified time frame.</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	achievement and the risk management process		defined and managed		
3.1.2 Project Planning and Analysis					
6) The project's activity analysis	<ul style="list-style-type: none"> - What are the project activities? - Does the project activity cover the deliverables of the project's expected output/outcome? - How did SDGs and NDCs develop into activities or criteria to select counterparts in each activity? 	QL	<ul style="list-style-type: none"> 1- Not clearly defined the project activities 2- Slightly clearly defined the project activities but did not cover the expected outputs/outcome 3- Somewhat clearly defined and cover the project output and outcome 4- Clearly define and cover the project output/outcome and related to the SDGs and NDCs. 5- Very clearly defined define and cover the project output/outcome and related to the SDGs and NDCs. 	4	<p>The implementation of the project consists of the following activities:</p> <ol style="list-style-type: none"> 1. Non-toxic cotton cultivation activities 2. Training activities for international products transformation skills 3. Providing in-depth consultation 4. Hiring a consultant to create a prototype product. 5. Activities that connect to tourism 6. Marketing and public relations <p>All activities are comprehensive and can meet project objectives and indicators. It also aligns with SDG 1, SDG 5.5.2 , SDG 8.3.1, SDG 11.4.1, SDG 12.4.2 (a).</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
7) Involvement of target groups/stakeholders in project planning and analysis.	<ul style="list-style-type: none"> - Are the project's target group and stakeholders involved in the project planning and analysis? <p>If any, identify the activity.</p>		<ul style="list-style-type: none"> 1- No involvement 2- Slightly involved and not cover all the target groups and stakeholders 3- Moderately involved and not cover all the target groups and stakeholders 4- Most of the target groups and stakeholders are involved 5- All of the target groups and stakeholders are involved. 	3	<p>The project's target audience participated in the workshop, presented the need, made product selection. The group of community enterprises participated in activities planning at their own local level as well as solving immediate problems such as in the event of a thrips outbreak in cotton fields the head of the enterprise group could come up with appropriate solution for their own cotton plantations and group members without having to report to the project leader first and could directly present the problem to the project leader later.</p> <p>In addition, the team of consultants who involved in product development would propose development ideas and exchange with project participants to jointly develop products, etc.</p>
8) The project's technical analysis	<ul style="list-style-type: none"> - What are the project's resource requirements? - Are the project's resources suitably related to the project's activities? - How were the project's resources obtained? 	QL	<ul style="list-style-type: none"> 1- No clearly define the project's resource requirements 2- Slightly clearly defined but not related to the project activities 3- Moderately clearly defined and partly 	4	<p>Resources that were needed in a project could be grouped as follows:</p> <ol style="list-style-type: none"> 1. Organic cotton production required lands for cultivation, good quality seeds, organic fertilizers and labors in the cultivation process and harvest. 2. Weaving required equipment to weave cotton, natural dyes, and labors in the weaving process. 3. Fabric Processing and Marketing required human resources with knowledge of design and understanding of current and future consumer

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			<p>related to the project activities</p> <p>4- Quite clearly defined and mostly related to the project activities</p> <p>5- Well-defined and all related to the project activities.</p>		<p>trends, sewing machines and auxiliary materials/components to create products</p> <p>The resources required in the project are carefully selected as non-toxic products if possible.</p> <p>The main resource, cotton, is defined as cotton from non-chemical plantation. In some community enterprise such as Ban Kok Weaving Group, etc, the cotton must be only organic cotton. In the dyeing process, natural dyes were recommended except in some cases of customer's requirement to use chemical dyes.</p>
9) The project's project organization & structure	<p>- How was the project's team formed?</p> <p>If any, define the procedure</p>	QL	<p>1- No clearly define the project's organization & structure</p> <p>2- Slightly clearly defined but not related to the project activities</p> <p>3- Moderately clearly defined and partly related to the project activities</p> <p>4- Quite clearly defined and mostly</p>	4	<p>The project management personnel structure consists of staff from the Loei Provincial Industrial Office serving as project manager responsible for planning and managing the overall project. The chairman of the community enterprise group together with a prototype product developer (consultants) are the responsible workers who carry out main activities which The Loei Provincial Industry Office determined.</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			related to the project activities 5- Well-defined and all related to the project activities.		
10) The project's value-for-money analysis	<p>- Is there the project's value-for-money conducted?</p> <p>*Either qualitative or quantitative analysis is acceptable for evaluation.</p>	QL	<p>1- No analysis was conducted</p> <p>2- Some analysis but hardly established result</p> <p>3- Fairly conducted cost and benefit analysis, with positive results</p> <p>4- Quite-well conducted cost and benefit analysis, with positive results in some dimensions (i.e., economic, social, and environmental)</p> <p>5- Well-conducted cost and benefit study, both economic and financial analysis with positive results</p>	3	<p>For the project's value-for-money analysis, the person in charge of the project stated that the value of money could not be assessed but also mentioned that the project showed accomplishment according to the project indicators and the objectives.</p> <p>From the information of the target groups participating in the project in some enterprises such as the Ban Na Pa Nad weaving group, they seized the opportunity to buy cotton from their local farmers instead of buying cotton from other channels. As a result, farmers participating in the project plan to continue cotton farming even after the end of the project. Similar directions were observed at the Ban Sam Kham Weaving Group and Ban Kang Pla Weaving Group which indicate that some activities will possibly be continued after the completion of the project</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			in all dimension (economic, social and environmental)		
3.1.3 Project Implementation					
11) Produce the planned deliverables (percentage of achievement)	- Does the project achieve all the planned deliverables?	QL	1- None or Slight of the planned deliverables achieved (25% achievement or less) 2- Some of the planned deliverables were achieved (more than 25% achievement) but the 3- Most of the planned deliverables were achieved (more than 50% achievement), and some activity indicators met the target 4- Most of the planned	5	The project activities are carried out as planned and achieve the following objectives: 1. To promote and develop identity and knowledge in cotton handicraft production from local wisdom and raw materials as well as a linkage to the tourism of Loei Province 2. To create internationally-bounded value-added cotton handicraft products and be more well-known 3. To create jobs and income for people in Loei Province

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			<p>deliverables were achieved (More than 75% achievement), and some activity indicators met the target</p> <p>5- All of the planned deliverables were achieved, and all activity indicators met the target</p>		
12) Implement the plan	<ul style="list-style-type: none"> - Does the project reach the target group? - Do all project activities reach all parts of the target group? - Are all project activities implemented as planned? 	QL	<ul style="list-style-type: none"> 1- Not meet the planned target group 2- Partly meet the planned target group, not achieve the target indicators 3- Mostly meet the planned target group and partly achieve the target indicators 4- Mostly meet the planned target group and achieve 	5	<p>The project implementation has achieved the planned goals as follows:</p> <ol style="list-style-type: none"> 1. A total of 150 “Cotton Valley Creation” trained and educated entrepreneurs that have knowledge and understanding of cotton handicraft production to meet the market demand. 2. A total of 50 “Cotton Valley Creation” value-added non-toxic pilot products that show Loei Province identity and culture. 3. A total of 9 “Cotton Valley Creation” Non-toxic cotton plantation landmarks (with areas of 100 Rai overall) that would also serve as learning centers to promote tourism. 4. Increase the number of distribution channels.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			the target indicators 5- Well accomplished and reached all target indicators		5. A total of 200 job employments during the project implementation.
13) Measure interim results attained	- Are participants and other key stakeholders satisfied with all aspects of the project? (Assess from the beneficiaries' perception)	QL	1- No assessment of beneficiaries' satisfaction 2- Project beneficiaries are slightly satisfied 3- Project beneficiaries are moderately satisfied 4- Project beneficiaries are quite highly satisfied 5- Project beneficiaries are highly satisfied	4	The target groups and stakeholders who participated in the project activities had a "high" level of satisfaction with their participation in project activities.
14) Materials, information, and presentations are suitable for the target group	- How did the projects' materials and information present to the target group?	QL	1- No suitable and relevant at all 2- Hardly suitable and relevant 3- Fairly suitable and relevant	4	In Project PR, online media and fashion show using pilot products were used to present the projects and products. This is considered suitable for the target group who are related to clothing design and fabric products.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	<ul style="list-style-type: none"> - Are all materials, information, and presentations suitable for the target group? <p>(Assess from the target groups' perception)</p>		<ul style="list-style-type: none"> 4- Quite suitable and relevant 5- Well-designed and communicated to the target group 		
15) The problems and obstacles in the project management process	<ul style="list-style-type: none"> - What are the problems and obstacles in project management? If any, define the problem and problem-solving process 	QL	<ul style="list-style-type: none"> 1- None of the problems was solved 2- Slight problems were solved, and most still are obstacles to the project's achievement 3- Some problems are solved and the project can be proceeded, but did not produce the expected outputs 4- Most problems are solved, and the project can be proceeded and 	4	<p>During the project implementation, there were problems and obstacles mainly due to the limited project implementation time (6 months) coupled with the delayed budget approval and the situation of the coronavirus disease 2019 epidemic. These unfortunate situations resulted in missing opportunity such as invitation of the famous product designers to join or help giving knowledges and consulting on product development.</p> <p>The problem solving process relied on modification of the activities to suit the situation while maintaining the core components and plans of the project.</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			produce the expected outputs 5- All problems are solved, and the project can be proceeded, produce the expected outputs, and monitor the process as a lesson learned for the future		
3.1.4 Overall Output evaluation: measure the immediate effect of the program and is aligned with the project objectives.					
16) Project's output	<ul style="list-style-type: none"> - How well has the project achieved its objectives (and sub-objectives)? - Identify the achieved outputs 	QT/QL	<ul style="list-style-type: none"> 1- None of the output achieved 2- the project was partly achieved (less than 40% achievement) 3- the project was partly achieved (less than 41%-60% achievement) 4- the project was mostly achieved (less than 61%-80% achievement) 	5	<p>The Project achieved its objectives and outputs. The output from the project can be delivered as specified.</p> <ol style="list-style-type: none"> 1. A total of 150 "Cotton Valley Creation" trained and educated entrepreneurs that have knowledge and understanding of cotton handicraft production to meet the market demand. 2. A total of 50 "Cotton Valley Creation" value-added non-toxic pilot products that show Loei Province identity and culture. 3. A total of 9 "Cotton Valley Creation" Non-toxic cotton plantation landmarks (with areas of 100 Rai overall) that would also serve as learning centers to promote tourism.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			5- All objectives are achieved (more than 80% achievement)		4. Increase the number of distribution channels. 5. A total of 200 job employments during the project implementation.
17) Achievement of project objectives	<ul style="list-style-type: none"> - Do all project objectives and indicators meet the targets? - Identify the indicators which meet the targets and do not meet the targets 	QT	<ul style="list-style-type: none"> 1- None or slight of the indicators meet the target (Less than 20% achievement) 2- 21%- 40% achievement 3- 41-60% achievement 4- 62-80% achievement 5- All indicators meet the targets (more than 80% achievement) . 	5	<p>The project objectives have been accomplished as planned.</p> <ul style="list-style-type: none"> 1. To promote and develop identity and knowledge in cotton handicraft production from local wisdom and raw materials as well as a linkage to the tourism of Loei Province 2. To create internationally-bounded value-added cotton handicraft products and be more well-known 3. To create jobs and income for people in Loei Province. <p>All the project indicators according to the output have been achieved as mentioned in 16).</p>
<p>3.1.5 Outcome evaluation: concerned with the long-term effects of the program and is generally used to measure the program goal. Consequently, outcome evaluation measures how well the program goal has been achieved.</p>					
18) Measure the achievement of the overall goals	<ul style="list-style-type: none"> - Have the overall program goals been achieved? - Identify the goals which meet the targets and do not meet the targets. 	QT	<ul style="list-style-type: none"> 1- None or slight of the goals achieved (less than 20% achievement) 2- 21%-40% achievement 	5	<p>The outcomes of the project have been determined as follows.</p> <ul style="list-style-type: none"> 1. Export market expansion. 2. Increase value-added products based on local culture, wisdom, and identity that meet market needs. 3. Job and income creation lead to self-reliance.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	- Identify visible results or changes arising from the project		3- 41%– 60% achievement 4- 61%-80% achievement 5- All goals achieved (more than 80% achievement)		4. Linkage to the tourism industry. 5. Economic stimulation in Loei Province. In overall, the project was able to achieve the expected results. After the implementation of the project, the weaving group was able to produce more cotton (more self-reliant) and be able to reduce the purchase of cotton from outside to use in the weaving process. Some groups, such as Ban Na Pa Nad, initiated a mechanism to encourage farmers to grow cotton and buying from the to use them as raw materials in the weaving process Several groups are able to apply the knowledge gained from prototype product developers to develop their own new products to meet the customer needs, both regular and new customers and new customers.
3.1.6 Specific Indicators (Project-based indicators)					
19) The impact of the project on achieving each Sustainable Development Goal (related to the project) each goal					
19.1) SDG 12.4.2 (a) Hazardous waste generated per capita; and (b) proportion of hazardous waste treated, by type of treatment	- How many volumes of chemical usage could be reduced by non-toxic cotton agriculture projects? - Volumes of waste from weaving	QT/QL	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	3	Environment Based on the project requirements, farmers and weavers would neither use chemicals in their cultivation nor use natural dyes to dye their fabrics. Many of the existing cotton plantations already use no chemicals or chemical fertilizers. As for the new farmers participating in the project, no chemicals and fertilizers would be

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	<p>process were decreased or not?</p> <p>- Smart Farming development contribution?</p>				<p>allowed because the project requires organic cotton cultivation. For those who previously used chemicals, no record of the amount of chemical use in cotton planting was collected. Thus, the farmers cannot clearly specify the amount of chemicals and chemical fertilizers.</p> <p>For dyeing and weaving processes, there are some groups that only dye natural colors, such as Ban Kok Bok. The chemical dye will be used only if it is a customer requirement. Similar to the farmer's situation, each weaving group does not record the amount of chemicals used in dyeing the fabric. Therefore, the amount of chemicals used in the dyeing process cannot be clearly identified.</p>
19.2) SDG 8.3.1 Proportion of informal employment in non-agriculture employment by sex	- Employment from cotton collection by sex?	QT/QL	<p>1- None of the impact on the goals/indicators</p> <p>2- Slight impacts</p> <p>3- Moderate impacts</p> <p>4- High impacts</p> <p>5- Very high impacts</p>	4	<p>Social/Economic</p> <p>Community enterprise groups have carried out the project by employing the group's chairman as a supervisor. More female workers have been employed than male workers because female workers have more knowledge and expertise in weaving than male workers.</p>
19.3) SDG 8.9.1 Tourism direct GDP as a proportion of total GDP and in growth rate	<p>- Economic values from project implementation?</p> <p>- Did the number of tourists increase or not</p>	QT/QL	<p>1- None of the impact on the goals/indicators</p> <p>2- Slight impacts</p> <p>3- Moderate impacts</p>	2	<p>Economic</p> <p>The economic value of tourism was not calculated during planning and implementation. During the COVID-19 pandemic, there are only a few tourists. The cotton planting season is not in</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	from project implementation?		4- High impacts 5- Very high impacts		line with the tourism season, and the cotton farms suffer from plant diseases and insects, which make them less visited by tourists. There are some tourists visiting the cotton farms, but not many.
19.4) SDG 11.4.1 Total per capita expenditure on the preservation, protection, and conservation of all cultural and natural heritage, by the source of funding (public, private), type of heritage (cultural, natural), and level of government (national, regional, and local/municipal).	- Was the cultural awareness of local people increased after the project implementation?	QT/QL	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	4	Social Most of the local cotton industry members are senior citizens, but the project implementation allowed the newer generation to join, continue, and expand the cotton business. Most of this newer generation are daughters/daughters-in-law of the current older members. At Ban Na Pa Nad, the daughter of the group chairman has joined and helped manage the group, increasing sale channels, and making clothes for sale. At Ban Kok Bok, a group member's daughter joined and became the new chairwoman and an important driving force among most elderly members. At Ban Kang Pla, the chairman's daughter also joined and upgraded the products from cotton fabrics to cotton dresses and ornaments. In a similar situation at Ban Sam Kham, the group chairman's daughter-in-law became an important driving force. After the project is implemented, there are more members, even if the new members are elderly people. This gives more production power. Many groups that can continue the activities or even

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
					expand have a younger generation as an important driving force. Despite the limited numbers of young people, it can be regarded as a good starting point for preserving culture.
19.5) SDG 5.5.2 The proportion of women in managerial positions	- Women's roles in implementing the project of the cotton weaving group - Authority for decision-making of women for project implementation	QT/QL	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	5	Social We have noticed more females driving the project. At the local level, 8 of the 9 groups are managed by chairwomen. The group chairperson manages various activities and has an important role with other stakeholders, such as collaborating with a team of consultants or product designers under the supervision of the Loei Provincial Industrial Office.
3.1.7 Overall Impact Evaluation:					
20) Measure the project's overall impacts on the progress of SDGs Note: Evaluating from the <i>Specific Indicators</i> or project-level indicators.	- How well does the output/outcome of the project achieve the progress of the SDGs, NDCs, and BCG components?	QL	1- None of the output/outcomes achieving progress on the SDGs 2- Slightly achieving 3- Moderately achieving 4- Much achieving 5- A great deal in achieving	4	Despite the project planning with only economic recovery as the main goal, the Project achieved progress in SDGs and BCG, particularly in the environmental and social aspects. The achievements are: 1) Reducing the use of chemicals in cotton planting activities and the process of weaving (dyeing fabrics). 2) Females have the freedom to operate, the power to make decisions, and the ability to manage within the scope of the weaving group.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
					3) The continuity of employment in the weaving group depends on the number of orders.
21) Measure the project's overall impacts on the progress of NDCs Note: Evaluating from the <i>Specific Indicators</i> or project-level indicators.	- How well does the output/outcome of the project achieve the progress of the SDGs, NDCs, and BCG components?	QL	1- None of the output/outcomes achieving progress on the NDCs 2- Slightly achieving 3- Moderately achieving 4- Much achieving 5- A great deal in achieving	3	Overall, the project may not be able to directly meet the greenhouse gas reduction target but there are some activities that can indirectly account for the reduction of greenhouse gas emissions such as reducing the use of chemicals and cotton re-generation in cotton cultivation activities. Cutting off old cotton tree would allow the remaining cotton rootstock to regrow and thus eliminating the need for tilling the soil.
3.1.8 Sustainability: Continuity of the benefits and impacts. The extent to which the net benefits of the intervention continue or are likely to continue.					
22) 22) Assess the project's net benefits of the intervention continue or are likely to continue	- Will the outputs last		1- Absolutely not. 2- Maybe not 3- Not sure / unclear 4- Very likely 5- Definitely possible	4	It is certainly possible that the project audience will be able to carry on their activities after the project ends. The target groups of the project already have the potential to carry out cotton cultivation and weaving activities. However, the fabric product processing still needs supports such as in products design, products development and products promotion and marketing.
23) Assess the project's flow of net benefits or the likelihood of net benefits continuing to	- Will the outcomes have potential to deliver in the long term		1- Absolutely not. 2- Maybe not 3- Not sure / unclear 4- Very likely 5- Definitely possible	4	The project may achieve the outcome as originally designed in the project. However, the long-term delivery of the outcome could not be confirmed with confidence. The continuity of project activities in terms of knowledge support,

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
deliver the outcomes and impacts over the medium and long-term.					knowhow in fabric product processing into cloths, and sale promotion/marketing may still be periodically necessary. Currently, there is no continuity in terms of budget or plans from the relevant agencies.
3.1.9 Cost-Benefits Analysis on making project greener and more inclusive					
24) Estimate the benefit and cost to make the project greener or more inclusive Note: Environment (greener) /social (inequality & gender) / economic (income generation & employment)	- Does the benefit outweigh the cost to make the project greener and more inclusive?	QL	1- Absolutely not. 2- Maybe not 3- Not sure/unclear 4- Very likely 5- Definitely possible	4	The project required that each activity focuses on production that does not use chemicals or use only necessarily. The information provided by every target group agreed on the greener aspects. Some groups, for Ban Kok Bok weaving group already achieved the non- chemicals use in every production process. In inclusiveness aspect, more women have important roles and became major driving force in project implementation both in management and operations. The project employment also resulted in female worker promotion. More numbers of women were employed than male workers to work in various activities.

Remark:

* QT = Quantitative Indicators and QL = Qualitative Indicators.

3.2 Multi-Criteria Analysis (MCDA) and Discussion

3.2.1 MCDA's Results – Cotton Valley Creation

Table V(a) MCDA's Results – Cotton Valley Creation

Evaluation Criteria		Weight	Total Score	Cotton Valley
RELEVANCE/ COHERENCE	Project Design/Planning	20%	100	68.00
EFFICIENCY	Project Implementation	20%	100	88.00
EFFECTIVENESS	Overall Output / Outcome	20%	100	100.00
IMPACT	Impacts on SDGs and NDC	20%	100	67.50
SUSTAINABILITY	Continuity of the benefits and impacts	20%	100	80.00
OVERALL EVALUATION		100%	500	403.50

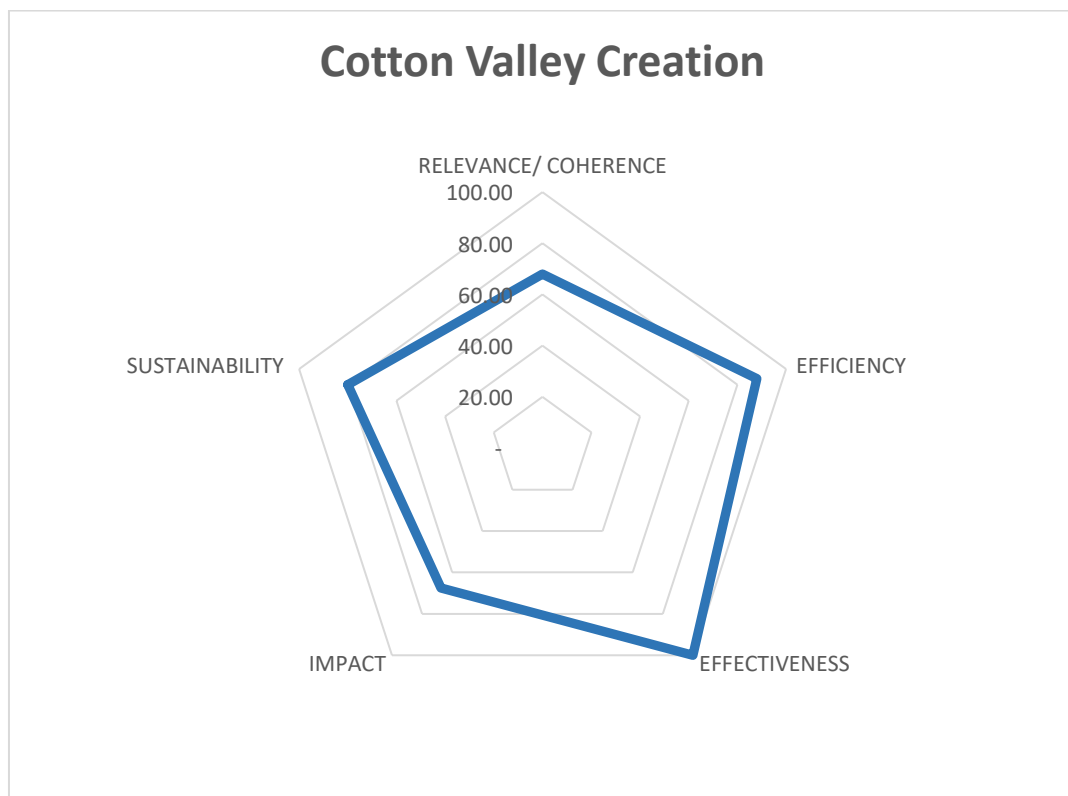


Figure V(a) Project Evaluation – Cotton Valley Creation

3.2.2 Discussion

1) Relevance/Coherence

The Cotton Valley Creation project has activities aligned with the Sustainable Development Goals (SDG 12.4.2(a), SDG 8.3.1, SDG 8.9.1, SDG 11.4.1, SDG 5.5.2) and GHG reduction targets. (NDCs). One is chemical-free cotton planting activities. Farmers obtained knowledge through training and planting support that is conducive to chemical-free cultivation, such as organic fertilizers and employment budgets for pest elimination. Another is an activity to promote fabric dyeing with natural colors. The project requirement is that the sample products to be developed must be from natural colors, making weavers use natural dyes and raw materials for dyeing. In addition, on issues related to gender equality, the project is open to all genders, with project managers giving freedom in management and operation to weaving group leaders, most of whom are women, for example, decision-making in cotton plantation employment and employment in weaving activities. At the same time, the product developers are free to think and design a product during the project's prototype product development.

2) Efficiency

When considering project results in terms of quality of work, budget, and duration. It was found that the project was completed within the specified time and spent 96 percent of the total budget. The project's outputs were in accordance with the indicators outlined in the project objectives. However, in developing a product prototype for the weaving group, the skill of the product developer was still needed as the weaving group members were still practicing to become more proficient.

3) Effectiveness

The Projects achieved the goal within a specified time (6 months) according to the following project indicators.

- 1) The 150 project participants have knowledge and understanding of cotton handicraft production to meet market demand.
- 2) The 50 prototypes of chemical-free cotton products have been made.
- 3) The 9 landmarks that could attract tourists, with a total area of 100 Rai of chemical-free cotton plantations, cotton production sources, cotton products, and comprehensive cotton product shops, have been established.
- 4) Expansion of the export market took place.
- 5) The employment for 200 people took place.

It was concluded that the project was carried out effectively.

4) Impacts

Environmental Impacts

SDG 12.4.2 (a) Hazardous waste generated per capita; and (b) proportion of hazardous waste treated, by type of treatment

The project's chemical-free cotton plantation activities are supervised against using chemicals in planting. Support was provided for necessary planting factors such as manure and the budget for employing pesticide workers, e.g., cotton bollworm removals and weeding. In addition, the weaving process emphasized using natural dyes such as blue from indigo, yellow from jackfruit hardwood, green from Chinese box tree's leaves, and red from Sappan tree or lac.

Economics Impacts

SDG 8.9.1 Tourism direct GDP as a proportion of total GDP and in growth rate

The economic value generated by tourism could not be estimated from the project. The cotton plantation activities did not coincide with the tourist season. During the project timeframe, the cotton plantation was affected by plant diseases and insects, the 2019 coronavirus epidemic, and the cotton planting period, resulting in less frequent tourist visits. However, it was found that some tourists were participating in weaving group activities.

Social Impacts

SDG 8.3.1 Proportion of informal employment in non-agriculture employment, by sex

The project does not discriminate or impose gender-based restrictions on activities and employment. From field data, it was found that there were more female participants in the project because most of the employment was in the weaving process, where females are more skilled. The activities that required more physical activity, such as tillage and soil preparation for cotton cultivation, were mainly done by male participants.

SDG 11.4.1 Total per capita expenditure on the preservation, protection, and conservation of all cultural and natural heritage by the source of funding (public, private), type of heritage (cultural, natural), and level of government (national, regional, and local/municipal).

There was no record of expenditure on the preservation, protection, and conservation of all cultural and natural heritage. The project, however, led to the local wisdom transfer from generation to generation, such as at Ban Klang Pla Weaving Group, Ban Na Pa Nad Weaving Group, and the Ban Kok Kok Weaving Group. There is a young generation with a more entrepreneurship mindset to help take care of the group's business, enabling them to develop various fabric products and have more distribution channels than other groups, which are reasonable indications and starting points for preserving the weaving culture.

SDG 5.5.2 the proportion of women in managerial positions

The driving force in the project's implementation was mainly females, particularly the organization at the local level (each weaving group). Eight of nine groups have women as chairpersons, and only one group has males as chairpersons. The group chairperson acted as a manager to organize and manage various activities together with a team of consultants or product designers under the supervision of the Provincial Industrial Office.

5) Sustainability

The selection of target groups for the project was based on the groups who were ready to perform the project activities. This allowed the project activities to proceed smoothly. Participation in the project led to more support for various cotton-related activities, e.g., cotton plantations got cotton flowers, which was the main raw material in the weaving process, and the employment budget meant more working labor. It also resulted in network formation between weaving groups and local fabric traders. At the end of the project, the activities tended to continue both in cotton planting and weaving activities as the market and customers started to recognize the groups. In the long run, there will be a new generation to inherit this local wisdom and culture and the weaving business of the group, as most of the present members of the weaving group are elderly people.

In summary, the overall evaluation

The project performance satisfied the specified indicators and project objectives. The project activities directly and indirectly met the Sustainable Development Goals (SDG 12.4.2 (a), SDG 8.3.1, SDG 8.9.1, SDG 11.4.1, SDG 5.5.2). On the issue of post-project sustainability, there is a high probability that the groups will be able to continue their activities. In the long run, as most of the present members of the weaving group are elderly, a mechanism to persuade the younger generation to inherit the local wisdom and culture of cotton weaving should be initiated.

4. Value for Money to make the project greener and be more inclusive

4.1 Cost-Benefit Analysis

The total used budgets of 16.5 million Baht are listed in the following table.

No.	Activities	Budget (Baht)
1	Cotton Farming	2,451,000
2	Seminar/Training	1,056,420
3	Cotton products design & development	3,652,100
4	Prototype product development & promotion	3,200,000
5	Activities to connect tourism in Loei Province	2,943,700
6	Activities related to marketing & PR	3,196,380
	Total	16,500,000

In cotton farming and production, the costs are shown in the following table.

Activity	Cost (Baht)
Traditional cotton farm (204 kg/Rai of cotton boll)	4,180
Non-chemical cotton farm (150 kg/Rai of cotton boll)	6,350
Cotton boll production from traditional farm (per kg)	20.5
Cotton boll production from non-chemical farm (per kg)	42.3
Processes (lint) (average cost per kg)	23
Processes (bale, spin) (average cost per kg)	206
Total cotton production cost for traditional cotton farm (per Rai)	22,778
Total cotton production cost for non-chemical cotton farm (per Rai)	20,025
Total cotton production cost for traditional cotton farm (per kg.)	335
Total cotton production cost for non-chemical cotton farm (per kg.)	400

4.2 Describe Project's Benefits

The benefits of the project could be considered in four aspects. The first is a network of cooperation establishment between weaving groups and product developers to help each other. For example, product developers design fabric patterns for weaving groups, who then could sell more woven fabrics. The product developers, in return, get the fabric as needed. The second is more well-known products from the local weaving group. The third is more knowledge and guidelines for developing hand-woven cotton products for members of the weaving group. And the last is more cooperation and strength within the communities. There are increasing numbers of members in the group. A mechanism to buy cotton flowers from members instead of from outside has been established. The project implementation benefited the weaving groups and the customers. It generated earning income from selling the fabric. The weaving group and the customers had more choices when buying the fabric with the desired pattern.

From financial analysis, it was found that non-chemical cotton production would enable the villagers to differentiate their cotton products and reduce their production costs. The table below shows the product price comparison. The improved hand-made product could be sold 2-4 times higher price.

Hand-made Product	Price (Baht)	Former Product	Price (Baht)
Cotton Cloths made from cotton farm	350	Cotton Cloths made from imported cotton	200
Handmade Cotton Fabric (per meter)	600	imported fabric (per meter)	150
Newly Designed cotton dress (per piece)	4000	Old-fashioned designed cotton dress (per piece)	1600

It was also found that better processes and improved design of cotton products would lead to income gains despite a 20-40% higher production cost. Finished products and cotton fabrics made from homemade cotton are priced 175-400% higher than those made from imported cotton. However, the project activities only benefit the participants

with greater potential. The table below compares three groups of project participants with different results.

Scenario	Example	Income Increase (Baht/Rai)	Comparison with Project Investment (Baht/Rai)
Successful case – cotton farming* & designed products (1-4)	Ban Na Pa Nad	Maximum 180,000	35,700 (Activities 1-2 only) 103,600
Moderate case – cotton farming* & cotton fabric (1)	Ban Kok Kok	Maximum 72,800	(Activities 1-4 only) 165,000 (All activities 1-6)
Non-successful case		None	
*Based on the assumption that the land for cotton farming was not used for other agricultures			

If the estimation was based on the project cost only for related activities, and the budget went directly to participants, the benefit for potential weaving SME groups would be several times higher than the cost.

4.3 Describe the Project's Costs

The implementation of the project has a positive impact on society and local investors. There were three types of costs. The first was before project implementation, including the project proposal survey costs and initial feasibility studies. The second and third were after implementation. The second was fixed costs during the project implementation, including product development consulting fees, training costs, wages for employment, and other supports. The last is an operating cost that is still incurred even after project implementation is finished, such as operating capital, labor costs, operating costs, production costs, and other direct costs. The weaving groups will bear the operating costs at their own expense after the project to continue the activities. It was found that some groups have the potential to do so even without external support.

Breaking down the project cost into 6 activities, it was noted that the participants' SME groups only directly received the budget from activities 1 and 2. They also directly received benefits but not wages in activities 3 and 4. However, activities 5 and 6 were probably used for the larger objectives and may have had no impact on cotton farming and product improvement.

The key obstacles that prevent communities from scaling up their production and increasing their sales for cotton farming would be labor shortage, land shortage, income instability, and lack of cotton lint machines. For finished cotton products, there would be a lack of interest from the young generation and a labor shortage. The potential for tourism development was also considered. Although the budget spending did not result in income increase from active tourism, the general opinions are that cotton-producing communities could gain from more cotton farming and cultural revitalization that lead to tourism sites

(with cotton-related experiences + cotton flowers season + cold season + others (cherry blossom, local tradition, etc)).

In conclusion, describe whether the project's benefits outweigh the cost.

Comparing the benefits generated by the project versus the initial costs, it was found that the initial costs before the project, such as the cost for surveying, the cost for the project's preliminary feasibility study, and costs during implementation, such as consulting fee for product development, and cost of training would in return resulted in more knowledge and experiences to develop and create cotton products for the target groups. Considering the operating costs that change over time, such as labor wages, production costs, and other direct expenses, at the end of the project, these costs would no longer be supported but incurred if the activities continue. It was found that the weavers could utilize their existing potential to strengthen their management during the project to optimize the costs, for example, purchasing cotton from local cotton farmers to create more incentives for new cotton plantations within communities to reduce purchasing outside raw materials. In summary, it was considered that the benefits arising from the project implementation are worth the cost incurred in the project activities.

5. Project-Based Recommendations

5.1 Project Cycle Process including Project Design, Planning, and Implementation

Recommendations on project design, planning, and implementation process have been listed.

- The determination of project objectives should be based on the needs of the project's target audience.
- Clear criteria for selecting project target groups should be developed.
- During project design, project evaluation should be considered, and the cost and benefits of implementing the project should be considered.
- Creating a visitor book and keeping statistics on the products that tourists choose to buy
- A consultation meeting should acknowledge the target group's needs. This would be an opportunity for the target groups to participate in addressing and solving problems during the project implementation.
- There should be activities that encourage the new generation to participate in the activities of the weaving group. as a starting point for learning local wisdom and culture

5.2 Project Outputs, Outcomes, and Impacts on SDGs, NDCs, and BCG Component

Some recommendations on the project's outputs, outcomes, and impacts on SDGs, NDCs, and BCG components have been listed.

- The project should have an income and expense accounting form for both individuals and weaving group members to record accounting transactions. The data should be used to calculate the economic value of the project's support.
- The project should allocate a budget to communicate with youth and local people to realize the importance and value of local culture and identity, especially cotton weaving.
- There should be a form to record materials used directly and indirectly, and product sale details in cultivation activities, weaving activity, fabric product processing activities, and promotion activities to be used to estimate the amount of greenhouse gas emissions
- The project should analyze the content of the project activities and synthesize issues related to holistic economic development, promoting the BCG economy as a selling point for woven cotton products of Loei Province.

VI. Project Evaluation Report – Processing of solar-powered dried bananas to generate income for the community

1. Project Background/Attributes

1.1 Responsible Agency

Office of Non-Formal and Informal Education (NFE) /Ministry of Education

1.2 Descriptions

Due to the outbreak of the Coronavirus Disease 2019 (COVID-19), many businesses and employment sectors in Phang Nga Province had to stop operations, especially tourism and services businesses, causing increasing number of unemployment. This crisis also primarily affected the income and livelihood of people and families of students who are in the Non-Formal and Informal Education (NFE) system in Phang Nga. Therefore, for maximum benefit, there is a need to substitute the revenue from the tourism income dependence, which used to be the main one, with the income from an occupation that uses locally available resources in Phang Nga Province. Most of the people in Phang Nga Province are farmers in agriculture. When large numbers of agricultural products come out, the market price falls. Bananas are abundant crops in Phang Nga, which could be processed into dried bananas to increase revenue and create added-value products significantly. However, local people and the families of the NEF students in Phang Nga Province still lack the know-how and technology to help facilitate dried bananas production as well as a building factory that will help to prevent damage from birds and insect disturbances, dust contamination, and rain as Phang Nga is one of the wettest areas. Therefore, to provide people in the area with more knowledge and new occupations, it is necessary to procure materials for solar-powered (sun-dried) banana baking and a place to educate and generate income for people in the community in Phang Nga.

The sun-dried banana processing project is considered a project to generate income for the community under the plan to restore the local economy and community to create jobs and careers leading to the income development from community products. The project brings knowledge and technology to increase income and create added-value products already available in the community, benefiting more than 200 households affected by the COVID-19 economic crisis. Implementing the solar-dried banana processing project to generate income for the community is integrated with the government, the private sector, the civil society, and local administrative organizations, as well as a provincial governance committee acting as an advisor and guiding project implementation.

1.3 Project Activities

- 1) The Office of Non-Formal and Informal Education secured the budget for the project.
- 2) The greenhouse for sun-dried banana baking was constructed.

1.4 Project Status

Project Scheduled completion date: 31 March 2021

Status: Completed

Total budget: 1 million Baht

1.5 Project objectives: The project has three main objectives.

- 1) To distribute income and increase career opportunities for people in the community
- 2) To enhance the potential and upgrade community production to be acceptable in the market with more quality
- 3) To create business opportunities that could respond to changes that will lead to a New Normal or economic restructuring

1.6 Target Group: people and families of students who are in Non-Formal and Informal Education

1.7 Geography: Tambon Takdat, Muang District, Phang-Nga Province

1.8 Outputs: The project has established two outputs.

- 1) 200 households from communities in Phang-Nga benefit from a greenhouse building and materials for sun-dried banana baking
- 2) Increased income of 3,456,000 Baht in the 2021 Fiscal year

1.9 Outcomes: Four outcomes could be identified from the project.

- 1) The Office of Non-Formal and Informal Education, Phang Nga Province, has sun-dried banana products available in the market.
- 2) There was a professional training and knowledge center for people in the community and target groups interested in the solar-powered banana processing project to generate income for the community.
- 3) Phang Nga Province can drive essential economic development to support and restore the economy from the impact of the coronavirus disease 2019.
- 4) Demonstration and promotion of renewable energy

2. Project Site Visits:

Project Site	Date/Time	List of Informants
Province/ District/ Subdistrict		– Farmers/ – Project Beneficiaries – Local Authorities responsible for the project
Tak Daet Subdistrict, Mueang Phang Nga District, Phang Nga Province	8 September 2565 Time 09.00-12.00 Time 13.00- 15.00	Local Authorities responsible for the project (Pang Nga Non-Formal Education) Project Beneficiaries

3. Multi-Criteria Decision Analysis (MCDA)

3.1 The set of evaluation criteria for the solar-dried Banana project

The set of evaluation criteria emphasizes the project cycle process of project design, planning, and implementation as well as the output, outcome, and impacts on SCGs, NDCs, and BCG components to learn that the project has been well developed to achieve their goals and objectives and evaluate how it impacts on the sustainability and green recovery.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
3.1.1 Project Design					
1) Identifying project target group needs in setting objectives	<ul style="list-style-type: none"> - How was the project designed with its objectives? - Are there any forms of need analysis or supported information to set the project objectives? <p>* Identifying the evidence showing the target groups and stakeholders' involvement in project design and setting its objectives.</p>	QL	<ul style="list-style-type: none"> 1- No evidence identifying procedure to define the project needs before setting the project objectives. 2- Mainly setting the objectives by using a top-down approach, slightly bottom-up to get the needs of the target group, 3- Mainly setting the objectives by using top-down, have some needs gathered from the target group 	2	The project objectives were determined based on the impact of the Coronavirus Disease 2019 epidemic affecting the occupation of people in the area. The Office of Non-Formal and Informal Education, Phang Nga Province, came up with the idea to support the affected students who are in the Non-Formal and Informal Education (NFE) system and their families by providing supply materials for baking bananas from solar energy as bananas are abundant agricultural crops in Phang Nga. The project could also serve as a place where people could learn (not a knowledge center) to create income in the community of Phang Nga Province.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	In the case of using the bottom-up approach, identify the procedure showing the bottom-up approach to set objectives.		<p>4- Mainly setting the objectives by a top-down approach with needs gathered from all target groups and stakeholders</p> <p>5- Objectives are set by working together from top-down and bottom-up approaches.</p>		
2) Project rationality	<ul style="list-style-type: none"> - What is the project's rationale? - Does the project rationale align with the SDGs and NDCs related to the project? 	QL	<p>1- No relation between the project's rationale and the SDGs and NDCs</p> <p>2- Slightly related between the project's rationale and the SDGs and NDCs</p> <p>3- Moderately related</p> <p>4- Quite related</p> <p>5- Strongly related</p>	3	<p>Due to the outbreak of the Coronavirus Disease 2019 (COVID-19), many businesses and employment sectors in Phang Nga Province had to stop operating, especially tourism and services businesses, causing a large amount of unemployment. This crisis also primarily affected the income and livelihood of people and families of students who are in the Non-Formal and Informal Education (NFE) system in Phang Nga. Therefore, for maximum benefit, there is a need to transform the revenue from tourism income dependence, which used to be the main one, to income from occupations that use locally available resources in Phang Nga Province. Bananas are abundant agricultural crops in Phang Nga that could be processed into dried bananas</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
					to increase revenue and significantly create added value. However, local people and the families of the NEF students in Phang Nga Province still lack the know-how and technology to help facilitate dried bananas production as well as a building factory that will help prevent damage from birds and insect disturbances, dust contamination, and rain as Phang Nga is one of the wettest areas. Therefore, to provide people in the area with more knowledge and new occupations, it is necessary to procure materials for solar-powered (sun-dried) banana baking and a place to educate and generate income for people in the community in the Province. Therefore, to provide people in the area with more knowledge and new occupations, it is necessary to procure materials for solar-powered (sun-dried) banana baking and a place to educate and generate income for people in the community in the Province. The project rationale aligns with the Sustainable Development Goals of Goals 2, 5,7, 8, and 12.
3) Defining the target groups (criteria of selection)	- What are the criteria used to identify the project's target groups?	QL	1- No criteria were determined, and not able to identify if the target group is appropriate	3	The target groups were selected from former students in the Non-Formal and Informal Education (NFE) system in Phang Nga and a group of housewives who participated in activities with NFE. There were selection criteria and specific qualifications for joining the project.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	<ul style="list-style-type: none"> - How well are the criteria developed? - Are the target groups appropriate in response to project objectives? - If any criteria, is the criteria ensure equity and inclusiveness? 		<p>2- Some criteria are hardly defined to ensure that the target groups are appropriate</p> <p>3- Fairly clear criteria and moderately ensure that the target groups are appropriate</p> <p>4- Quite clear criteria and most target groups are appropriate.</p> <p>5- Obvious criteria and all target groups are appropriate</p>		
4) Output/ Outcome/ Impact to SDGs and NDCs	<ul style="list-style-type: none"> - How do the outputs and outcomes of the project address the impacts on related SDGs and NDCs? - Identify the SDGs and NDCs related to the project (i.e., Green Recovery, Environmental, 	QL	<p>1- No relation between the project's output/outcome and the impacts on SDGs, NDCs, and BCG component</p> <p>2- Slightly related between the project's output/outcome</p>	3	<p>The project's goal was to provide one unit of solar-powered banana baking equipment, and 200 households participated. The project activities are linked to the Sustainable Development Goals (SDGs) and gas reduction targets and Nationally Determined Contributions (NDCs) as follows:</p> <p><i>Environment (primarily achieved)</i></p> <p>1. SDG 12.3.1 (a) and NDCs. Bananas are processed for food preservation to reduce</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	Inequality reduction, and Inclusiveness.		and the impacts on SDGs, NDCs, and BCG component 3- Moderately related 4- Quite related 5- Strongly related		<p>spoilage and extend the shelf life for longer storage food.</p> <p>2. SDG 7.b.1 and NDCs. Solar energy is used for food preservation and converted into electrical energy to power the facility's exhaust fan.</p> <p><i>Economic (did not achieve)</i></p> <p>1) SDGs 8.3.1. The project's main activity is training. It did not reach the stage where the result of the project became community products. Therefore, there is no employment in agriculture or employment in other sector related to the project.</p> <p>2) SDG 8.2.1. Similar as SDG 8.3.1, the project's main activity is training. It did not reach the stage where the result of the project become community products. Therefore, there is no employment in agriculture or employment in other sector related to the project.</p> <p><i>Social (partly achieved)</i></p> <p>1. SDG 2.3.2. The program's main activity is training. It did not reach the stage where the result of the project become community products. It helped promoting food security but not income security.</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
					2. SDG 5.5.2. The people in charge of the project are mainly female and the proportion of female staff members is higher than males.
5) Defining the project risk management process	<ul style="list-style-type: none"> - Is there any concern about risks related to the project in the project design process? - Are there any expected risks or obstacles that will make the project unsuccessful? - Is there any risk prevention or management integrated into project design? <p>*If any, identify the risk and obstacles to the project's achievement and the risk management process</p>	QL	<ul style="list-style-type: none"> 1- None of the risks and obstacles are determined, and management 2- Some risks or obstacles are determined but hardly defined and managed 3- Some risks or obstacles are fairly determined and managed 4- Some risks or obstacles are well-determined and managed 5- All risks and obstacles are well-defined and managed 	5	A risk management plan was prepared and attached to the project document during the project design process.
3.1.2 Project Planning and Analysis					

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
6) The project's activity analysis	<ul style="list-style-type: none"> - What are the project activities? - Does the project activity cover the deliverables of the project's expected output/outcome? - How did SDGs and NDCs develop into activities or criteria to select counterparts in each activity? 	QL	<ul style="list-style-type: none"> 1- Not clearly defined the project activities 2- Slightly clearly defined the project activities but did not cover the expected outputs/outcome 3- Somewhat clearly defined and cover the project output and outcome 4- Clearly define and cover the project output/outcome and related to the SDGs and NDCs. 5- Very clearly defined define and cover the project output/outcome and related to the SDGs and NDCs. 	2	Activities are designed in accordance with objectives and indicators. The project activities consisted of building a solar-powered baking house for baking bananas and providing a workshop on making solar-dried bananas. The activities were clearly defined and related to outputs/outcomes and SDGs. However, one of the project outputs on increasing income could not be delivered. The solar-powered dry bananas from the project did not become community product.
7) Involvement of target groups/stakeholders	<ul style="list-style-type: none"> - Are the project's target group and stakeholders involved in the 		<ul style="list-style-type: none"> 1- No involvement 2- Slightly involved and not cover all 	3	The target groups of the project were students who are in the Non-Formal and Informal Education (NFE) system, their families, and employers related to NFE. They participated in

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
in project planning and analysis.	project planning and analysis? If any, identify the activity		the target groups and stakeholders 3- Moderately involved and not cover all the target groups and stakeholders 4- Most of the target groups and stakeholders are involved 5- All of the target groups and stakeholders are involved.		the workshop and learnt how to make dried bananas from the NFE instructors. Their involvement in the project planning and analysis was mainly in setting the date and time for the workshop. Some employees related to NFE in Phan Nga were involved in the project planning.
8) The project's technical analysis	<ul style="list-style-type: none"> - What are the project's resource requirements? - Are the project's resources suitably related to the project's activities? - How were the project's resources obtained? 	QL	<ul style="list-style-type: none"> 1- No clearly define the project's resource requirements 2- Slightly clearly defined but not related to the project activities 3- Moderately clearly defined and partly related to the project activities 	4	Resources that were required in a project can be identified as, <ul style="list-style-type: none"> 1. personnel/instructors who have knowledge in making dried bananas and could be able to transfer knowledge to project participants, 2. banana as raw material, 3. The solar-powered baking house is the main equipment for the training. Bananas, the primary raw material in the training process, were the participants' home-grown products and were partly bought from local farmers.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			4- Quite clearly defined and mostly related to the project activities 5- Well-defined and all related to the project activities.		
9) The project's project organization & structure	- How was the project's team formed? If any, define the procedure	QL	1- No clearly define the project's organization & structure 2- Slightly clearly defined but not related to the project activities 3- Moderately clearly defined and partly related to the project activities 4- Quite clearly defined and mostly related to the project activities 5- Well-defined and all related to the project activities.	4	The project management personnel structure consisted of staff from the Office of Non-Formal and Informal Education, Phang Nga Province as project administrators. They were responsible for planning and managing the project. There were NFE teachers/instructors who served as coordinator between the project leader and the target group/project participants. The participants were from the project from various sub-districts in the nearby areas and were responsible for joining the training workshop.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
10) The project's value-for-money analysis	<p>- Is there the project's value-for-money conducted?</p> <p>*Either qualitative or quantitative analysis is acceptable for evaluation.</p>	QL	<p>1- No analysis was conducted</p> <p>2- Some analysis but hardly established result</p> <p>3- Fairly conducted cost and benefit analysis, with positive results</p> <p>4- Quite-well conducted cost and benefit analysis, with positive results in some dimensions (i.e., economic, social, and environmental)</p> <p>5- Well-conducted cost and benefit study, both economic and financial analysis with positive results in all dimension (economic, social and environmental)</p>	2	<p>For the project's value-for-money analysis, the person in charge of the project stated that the monetary value could not be assessed but also mentioned that the solar-powered baking house was a valuable device for knowledge transfer in the training workshop because the participants could practice and learn to do by themselves. After the project completion, they continue to allow using this solar-powered baking house free of charge for people who want to develop other dry products (product development trial phase only).</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
3.1.3 Project Implementation					
11) Produce the planned deliverables (percentage of achievement)	- Does the project achieve all the planned deliverables?	QL	<p>1- None or Slight of the planned deliverables achieved (25% achievement or less)</p> <p>2- Some of the planned deliverables were achieved (more than 25% achievement) but the</p> <p>3- Most of the planned deliverables were achieved (more than 50% achievement), and some activity indicators met the target</p> <p>4- Most of the planned deliverables were achieved (More than 75%</p>	3	The project activities are carried out as planned. During the project implementation, there were problems and obstacles mainly due to the situation of the coronavirus disease 2019 epidemic. Some adjustments on the training format according to the COVID-19 situation were necessary. The budget was also cut, and management had to adjust the operation according to the budget within the project timeline.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			achievement), and some activity indicators met the target 5- All of the planned deliverables were achieved, and all activity indicators met the target		
12) Implement the plan	<ul style="list-style-type: none"> - Does the project reach the target group? - Do all project activities reach all parts of the target group? - Are all project activities implemented as planned? 	QL	<ul style="list-style-type: none"> 1- Not meet the planned target group 2- Partly meet the planned target group, not achieve the target indicators 3- Mostly meet the planned target group and partly achieve the target indicators 4- Mostly meet the planned target group and achieve the target indicators 	3	The project reached the target group, and all the activities had been implemented as planned. The project implementation has achieved its objectives as, <ul style="list-style-type: none"> 1. one unit of solar-powered banana baking equipment was provided. 2. The project benefited 200 households in the community who participated in the activities. However, the income generating target indicator was not achieved in the project.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			5- Well accomplished and reached all target indicators		
13) Measure interim results attained	<ul style="list-style-type: none"> - Are participants and other key stakeholders satisfied with all aspects of the project? <p>(Assess from the beneficiaries' perception)</p>	QL	<ul style="list-style-type: none"> 1- No assessment of beneficiaries' satisfaction 2- Project beneficiaries are slightly satisfied 3- Project beneficiaries are moderately satisfied 4- Project beneficiaries are quite highly satisfied 5- Project beneficiaries are highly satisfied 	4	The target groups and stakeholders who participated in the project activities had a "high" level of satisfaction with their participation in the project activities. They gained knowledge, had an opportunity to practice, and learned the guidelines for career build-up and advancement and, ideally how to earn extra income. The participants also felt satisfied from having the opportunity to join the socializing activities with other project participants during COVID-19.
14) Materials, information, and presentations are suitable for the target group	<ul style="list-style-type: none"> - How did the projects' materials and information present to the target group? - Are all materials, information, and presentations 	QL	<ul style="list-style-type: none"> 1- No suitable and relevant at all 2- Hardly suitable and relevant 3- Fairly suitable and relevant 4- Quite suitable and relevant 	3	The workshop handbook was prepared to present the project information. The handbook is portable, easy to carry, and contains the necessary information that the participants could review after completing training activities. Some participants, however, shared their opinions that the handbook was difficult to read because of

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	suitable for the target group? (Assess from the target groups' perception)		5- Well-designed and communicated to the target group		the small font size and they preferred more of learning-by-doing activities and practice.
15) The problems and obstacles in the project management process	- What are the problems and obstacles in project management? If any, define the problem and problem-solving process	QL	1- None of the problems was solved 2- Slight problems were solved, and most still are obstacles to the project's achievement 3- Some problems are solved, and the project can be proceeded, but did not produce the expected outputs 4- Most problems are solved, and the project can be proceeded and produce the expected outputs 5- All problems are solved, and the project can be	3	There were some problems and obstacles encountered during the implementation of the project. Change in training plan was required due to the continued impact of coronavirus disease 2019 epidemic situation. In problem solving, the management process had to be modified accordingly in order to adjust the activities to suit the situation. In addition, the budget was cut, and the approval was delayed, causing the project implementation to not be as smooth as planned. The project did not reach the output on income generating as the solar-powered bananas did not become commercially available community product.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			proceeded, produce the expected outputs, and monitor the process as a lesson learned for the future		
3.1.4 Overall Output evaluation: measure the immediate effect of the program and is aligned with the project objectives.					
16) Project's output	<ul style="list-style-type: none"> - How well has the project achieved its objectives (and sub-objectives)? - Identify the achieved outputs 	QT/QL	<ul style="list-style-type: none"> 1- None of the output achieved 2- the project was partly achieved (less than 40% achievement) 3- the project was partly achieved (less than 41%-60% achievement) 4- the project was mostly achieved (less than 61%-80% achievement) 5- All objectives are achieved (more than 80% achievement) 	4	The project's achieved outputs are one unit of solar baking house and 200 community members who participated in the training activities. However, the increased income, one of the outputs, was not achieved.
17) Achievement of project objectives	<ul style="list-style-type: none"> - Do all project objectives and 	QT	<ul style="list-style-type: none"> 1- None or slight of the indicators meet 	4	Achievement of project objectives has been evaluated as "good" level. The indicators on

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
	<ul style="list-style-type: none"> indicators meet the targets? - Identify the indicators which meet the targets and do not meet the targets 		<ul style="list-style-type: none"> 1- the target (Less than 20% achievement) 2- 21%- 40% achievement 3- 41-60% achievement 4- 62-80% achievement 5- All indicators meet the targets (more than 80% achievement) 		<p>providing solar-powered facility and numbers of participants who benefited from the workshop have been met. However, indicator on income generating was not met as the solar-powered dry bananas did not become a commercially available community product that can generate revenue.</p>
<p>3.1.5 Outcome evaluation: concerned with the long-term effects of the program and is generally used to measure the program goal. Consequently, outcome evaluation measures how well the program goal has been achieved.</p>					
18) Measure the achievement of the overall goals	<ul style="list-style-type: none"> - Have the overall program goals been achieved? - Identify the goals which meet the targets and do not meet the targets. - Identify visible results or changes arising from the project 	QT	<ul style="list-style-type: none"> 1- None or slight of the goals achieved (less than 20% achievement) 2- 21%-40% achievement 3- 41%– 60% achievement 4- 61%-80% achievement 	3	<p>The outcomes of the projects have been identified as follows.</p> <ol style="list-style-type: none"> 1. Office of Non-Formal and Informal Education, Phang Nga Province has sun-dried bananas product available in the market. 2. A professional training and knowledge center for people in the community and target groups who are interested in the solar-powered banana processing project to generate income for the community.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			5- All goals achieved (more than 80% achievement)		<p>3. Phang Nga Province can drive a basic economic development to support and restore the economy from the impact of the coronavirus disease 2019.</p> <p>4. Demonstration and promotion of renewable energy</p> <p>Despite outcomes achievement in a “good” level, the first two outcomes were not met. However, the solar baking house can be used as training and training facility for other potential activities/projects in the long run. Those who have participated in the training would likely be able to apply the knowledge to develop other products further. Another concern is that although the facility is available for people who want to use it to develop different products, it is inconvenient because of its location.</p>
3.1.6 Specific Indicators (Project-based indicators)					
19) The impact of the project on achieving each Sustainable Development Goal (related to the project) each goal					
19.1) SDG 12.3.1 (a) Food loss index and (b) food waste index	<p>1. Rational for raw materials management by solar energy drying ?</p> <p>2. Suggestions to products?</p>	QT/QL	<p>1- None of the impact on the goals/indicators</p> <p>2- Slight impacts</p> <p>3- Moderate impacts</p> <p>4- High impacts</p>	3	<p>Environment</p> <p>The project was implemented by conducting a workshop to provide knowledge on how to make dried bananas for food preservation. The participants can further apply for other food preservation at the household level and reduce</p>

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			5- Very high impacts		food waste. NFE could also mentor other groups who plan to develop solar-powered dry products and provide rental facility which would benefit new entrepreneurs.
19.2) SDG 7.b.1 Installed renewable energy-generating capacity in developing countries (in watts per capita)	1. Consideration on Greenhouse Gas Emission ? 2. Training hours of employees in the topic of renewable energy	QT/QL	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	4	Environment The solar-powered baking facility used solar power to dry bananas and utilized electricity from solar panels to power the facility's exhaust fan. The whole system used renewable energy. However, as the facility's main purpose was for training, the greenhouse gas emission was not taken into account in the project's objectives and outputs.
19.3) SDG 8.3.1 Proportion of informal employment in non-agriculture employment, by sex	1. Employment (Number of Employees) 2. Return on investment from project participation (Money/objects/job creation)	QT/QL	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts Very high impacts	2	Economic Because the project's output shifted to focus on training. It did not reach the stage where the result of the project became community products. Therefore, there is no employment in agriculture or employment in other sectors related to the project. However, the project stimulated new entrepreneurs' ideas of making other dry preserved food.
19.4) SDG 8.2.1 Annual growth rate of real GDP per employed person	1. Benefit value from project implementation (Money/objects/job creation)	QT/QL	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts	2	Economic Similar to 19.3) the project's output shifted to focus on training. It did not reach the stage where the result of the project became community products. Therefore, there is no

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
			4- High impacts Very high impacts		employment in agriculture or employment in other sectors related to the project. Parts of the budget, however, are directly beneficial to the increased income of the contractor who built the solar-powered facility.
19.4) SDG 2.3.2 Average income of small-scale food producers, by sex and indigenous status	1. Return on investment from project participation (Money/objects/job creation)	QT/QL	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts Very high impacts	1	Social Project activities did not include or cover promoting/supporting small-scale local processed food producers because there were only educational activities and training workshops for the selective target group. The training outcome also did not lead to developing community products as initially planned.
19.5) SDG 5.5.2 the proportion of women in managerial positions	1. Authorities for decision making of women 2. Collaboration among dried food female entrepreneurs	QT/QL	1- None of the impact on the goals/indicators 2- Slight impacts 3- Moderate impacts 4- High impacts 5- Very high impacts	5	Social There was no gender discrepancy in the project activities. Due to the nature of the activity, most of the participants in the project were female. As for the project management, the work was smoothly transferred from the male project supervisor to the female project supervisor during the transition and retirement period. No conflicts or obstacles have arisen from gender issues.
3.1.7 Overall Impact Evaluation:					
20) Measure the project's overall impacts on the progress of SDGs	- How well does the output/outcome of the project achieve the progress of the	QL	1- None of the output/outcomes achieving progress on the SDGs	3	Overall, the project may be able to meet the Sustainable Development Goals and BCG mainly in environmental and social aspects but miss the economic aspect. It reduced food waste using

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
Note: Evaluating from the <i>Specific Indicators</i> or project-level indicators.	SDGs, NDCs, and BCG components?		2- Slightly achieving 3- Moderately achieving 4- Much achieving 5- A great deal in achieving		food preservation and social equality among genders but failed to increase household income by making commercially available dry banana products.
21) Measure the project's overall impacts on the progress of NDCs Note: Evaluating from the <i>Specific Indicators</i> or project-level indicators.	- How well does the output/outcome of the project achieve progress in the SDGs, NDCs, and BCG components?	QL	1- None of the output/outcomes achieving progress on the NDCs 2- Slightly achieving 3- Moderately achieving 4- Much achieving 5- A great deal in achieving	3	Overall, the project achieved a renewable energy aspect and reduced greenhouse gas emissions, although no estimation is possible as the solar-powered facility was only used for training. However, if the facility would be used as a platform to produce commercially available products in the future, it would be able to meet the greenhouse gas reduction target by using solar energy, a clean energy, in the production process.
3.1.8 Sustainability: Continuity of the benefits and impacts. The extent to which the net benefits of the intervention continue or are likely to continue.					
22) Assess the project's net benefits of the intervention continue or are likely to continue	- Will the outputs last -		1 Absolutely not. 2 Maybe not 3 Not sure / unclear 4 Very likely 6- Definitely possible	4	The Non-Formal Education Office may be able to carry out training activities related to dry food processing after the program ends. The solar-powered facility is in good condition and could be utilized in the long term. However, a lack of personnel/experts in the promotion and creation of new products from dry food processing could be a concern in future project continuity.

Project Cycle Process	Evaluation Questions/ Issues	QT/ QL	Scale of measurements (1 to 5 interval scale)	Score	Identify reasons/ evidence
23) Assess the project's flow of net benefits or the likelihood of net benefits continuing to deliver the outcomes and impacts over the medium and long-term.	- Will the outcomes have potential to deliver in the long term -		1- Absolutely not. 2- Maybe not 3- Not sure / unclear 4- Very likely 5- Definitely possible	3	The project has not achieved the outcome of income generating, which was an early indicator designed in the project. In the long term, the facility can still be used for training workshops to increase the participants who will obtain knowledge in food preservation. Some might apply the idea in real product development. Some of the outcomes can potentially be delivered in the long term if more support is provided, especially in developing new products.
4.9 Cost-Benefits Analysis on making project greener and more inclusive					
22) Estimate the benefit and cost to make the project greener or more inclusive Note: Environment (greener) /social (inequality & gender) / economic (income generation & employment)	- Does the benefit outweigh the cost of making the project greener and be more inclusive?	QL	1- Absolutely not. 2- Maybe not 3- Not sure / unclear 4- Very likely 5- Definitely possible	4	The benefit from this project outweighs the cost qualitatively in terms of environmental and social aspects. The implementation of projects provided environmentally friendly facilities and activities. Food preservation by solar energy reduces food waste and greenhouse gas emissions from electricity used during the drying process, coupled with reducing greenhouse gases from the decay process of food waste. The project promotes the contribution to better environmental quality. From a social aspect, gender inequality was never an issue in the project.

Remark:

* QT = Quantitative Indicators and QL = Qualitative Indicators.

3.2 Multi-Criteria Decision Analysis (MCDA) and Discussion

3.2.1 MCDA's Results—Solar-Dried Banana Project

Table VI(a) MCDA's Results—Solar-dried Banana Project

Evaluation Criteria		Weight	Total Score	Solar-dried Banana
RELEVANCE/ COHERENCE	Project Design/Planning	20%	100	62.00
EFFICIENCY	Project Implementation	20%	100	64.00
EFFECTIVENESS	Overall Output / Outcome	20%	100	70.00
IMPACT	Impacts on SDGs and NDC	20%	100	52.50
SUSTAINABILITY	Continuity of the benefits and impacts	20%	100	70.00
OVERALL EVALUATION		100%	500	318.50

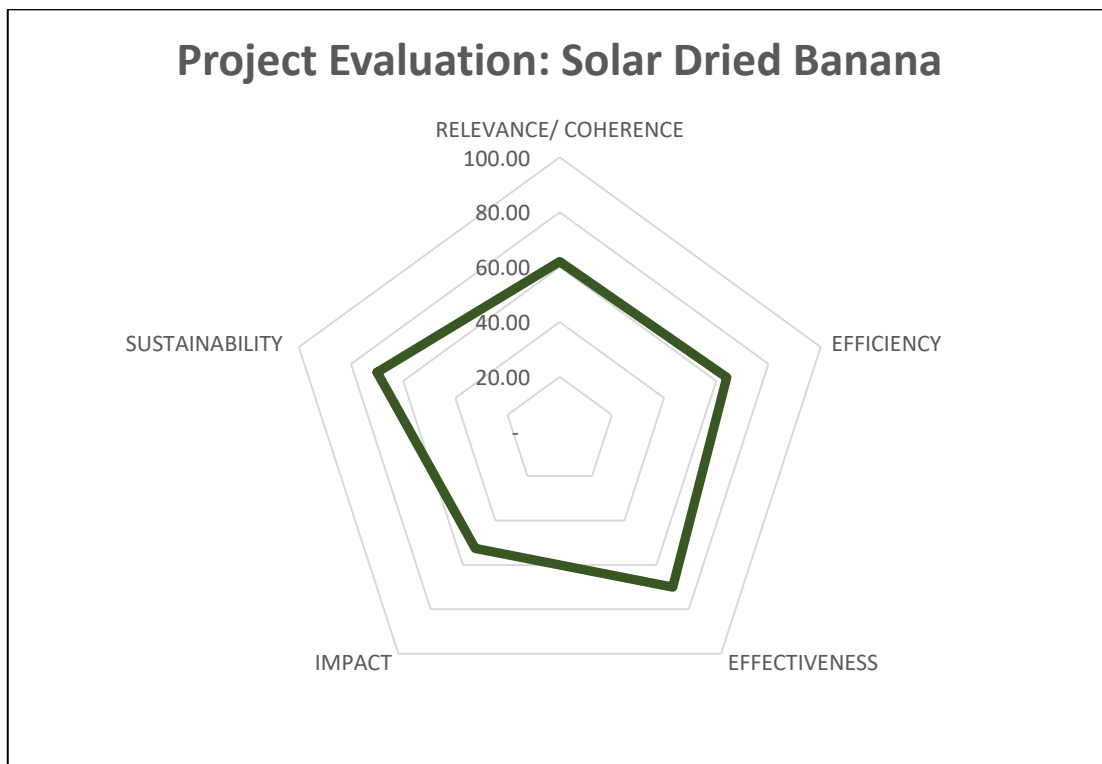


Figure VI(a) Project Evaluation—Solar Dried Banana

3.2.2 Discussion

1) Relevance/Coherence

The project has activities in line with the Sustainable Development Goals (SDG 12.3.1 (a), SDG 7.b.1, and (b), SDG 5.5.2) and indirect GHG reduction targets but failed to deliver the outcomes related to SDG 8.3.1, SDG8.2.1, and SDG 2.3.2. The project activities are constructing a solar drying facility and training to educate the target group on food preservation by solar drying. The solar-drying aerator house is more efficient than conventional drying and helps reduce food spoilage. By turning the raw materials into preserved dry bananas using a solar-powered preservation process, the shelf life of food is prolonged. In addition, solar drying plants use solar energy as the only energy source, and they have no external electric power. This is regarded as clean and renewable energy.

2) Efficiency

Considering the project implementation results in terms of quality of work, duration, and budget, it was found that the workshop/training activities had been completed within the project's timeframe. A budget of 400,000 baht was used to build solar-powered housing from a total budget of 1,000,000 baht initially. Part of this total budget was cut to support COVID-19 prevention/management activities, but the rest was for workshops/training. More than 200 households benefited from the training. However, the project did not lead to the development of dry banana community products for commercial sale, thus failing to achieve the project's additional goals of developing community products and services.

3) Effectiveness

Some of the project indicators within the timeframe were achieved. These indicators include one solar drying facility and more than 200 people in the community benefited from the training but did not achieve further goals, which is to develop the community's products and services

4) Impacts

Environmental Impacts

SDG 12.3.1 (a) Food loss index and (b) food waste index

The project's main activity is to host workshops and training to educate the local community on how to make solar-dried bananas for food preservation. The participants can apply their knowledge at the household level to preserve food for long periods and reduce food spoilage. In the future, if a group of NFE-related community or project participants have more interest in developing other products to reduce food waste, the Office of the Non-Formal and Informal Education can provide a solar drying facility free of charge, which will be of great benefit to early-stage entrepreneurs.

SDG 7.b.1 Installed renewable energy-generating capacity in developing countries (in watts per capita)

The solar drying facility was designed to use electricity solely from solar panels and solar heat as clean energy for the whole system. This helps reduce the usage of external electricity made from fossil fuels. The training has been provided for personnel of The Office of the Non-Formal and Informal Education (NFE) and those who participated in the project before use to gain knowledge and understanding of how solar drying housing works.

Economics Impacts

SDG 8.3.1 Proportion of informal employment in non-agriculture employment by sex

This focus of the project has shifted to training. No employment in agriculture or employment in other project-related activities occurred. The project budget was used to supply the solar drying house and training. Therefore, the implementation of the project is not in line with the Sustainable Development Goal of 8.3.1 on the proportion of informal employment in non-farm employment

SDG 8.2.1 Annual growth rate of real GDP per employed person

This focus of the project has shifted to training. No employment in agriculture or employment in other project-related activities occurred. The project budget was used to supply the solar drying house and training. Therefore, the implementation of the project is inconsistent with the Sustainable Development Goal of 8.2.1 on the annual growth of GDP of the project employees

SDG 2.3.2 Average Income of small-scale food producers by Sex and Indigenous Status

The project activities do not include supporting small-scale processed food producers in the local area. It provided only educational activities and training for the target group. As a result, SDG 2.3.2, the Average income of small-scale food producers by sex and indigenous status, was not achieved.

Social Impacts

SDG 5.5.2 the proportion of women in managerial positions

There was no gender discrimination in the implementation of the project. Due to the nature of the activity, most of the project participants were female. During the project implementation, because of personnel retirement, the project administration work was transferred from a male supervisor to a female project supervisor, and the project implementation could continue smoothly until project completion.

5) Sustainability

As the main activities of the project were workshops and training and the solar-powered drying facility, which is necessary equipment for training in food preservation by drying process, is still in ready-to-use condition, after the end of the project, NFE can organize additional training workshops to educate other target groups who are interested in making food preservation. The NFE also allows community entrepreneurs to use or rent solar drying houses at their request, according to the NFE regulations.

In summary, the overall evaluation

The project delivered a performance that aligns with some indicators and objectives. Its activities met some of the Sustainable Development Goals but did not deliver the development of revenue-generating products and services for project participants during and after the implementation. On the issue of sustainability in post-project activities, there is a high probability that NFE will be able to organize additional training workshops in courses related to drying food preservation and might generate some revenue from renting the equipment to some entrepreneurs who have an interest in developing drying preserved food.

4. Value for Money to make the project Greener and more inclusive

4.1 Describe Project's Benefits

The benefits of the project are that 1) NFE has a solar-powered drying facility that can be used as a long-term tool for workshop training on food preservation by the drying process, 2) more than 200 people in the community understood the importance of food processing, and food waste reduction, and 3) people in nearby areas can request to use the solar-powered housing to develop their products.

Although no income was generated from the project, and the local dry banana product was not realized, the solar-powered drying facility built is still functioning and could continue to be used for several years. The Office of the Non-Formal and Informal Education and the NFE-related community could financially gain from the project in the future through 2 business models.

- 1) NFE rents out solar-powered drying facilities to outside local entrepreneurs. This model was in discussion, but its difficulty is due to the facility's location, which is in the perimeter of a government office. Based on the assumption that the facility rental rate was a relatively low 10,000 Baht per month, the return on investment would be 3.3 years and 6.6 years for the construction cost and the total cost, which included training activities.
- 2) NFE related communities make local products for sale, e.g., dry bananas. Solar dry banana usually makes a profit margin of around 20% for wholesale. The wholesale price of dry banana is 90 Baht per kilogram while the total production cost, raw materials, labor cost, and packaging included, is estimated to be 75 Baht. The community needs to produce and sell 53.3 tons of dry bananas to

cover the project's cost. For comparison, Bang Krathum District in the Phitsanulok province, famously known for the dry bananas OTOP, produces 720-1,200 tons of dry bananas annually and uses the raw material (raw banana) of about 6,000 tons annually. If the Phang Nga Province could produce dry bananas of 24 tons per year (2 tons per month), the return on investment (payback period) would be 2.2 years. One concern, however, is that bananas are never the main fruit product of the Phang Nga province. It was not grown commercially as an export fruit but for household consumption and usage. Two tons of dry bananas would require raw bananas of 8 tons per month or, on average, 270 kilograms per day, which is very possible. The other option would be to use the facility for other food preservation, such as marine food, so the profit margin and return on investment could be faster.

4.2 Describe Project's Costs

The project implementation costs were solar-powered drying house construction (400,000 Baht) and workshop/training (approximately 400,000 Baht) from the total budget of 1 million Baht. Parts of the total budget (exact amount not known) were used in the COVID-19 prevention activities, which were not directly related to the project. Thus, it was assumed that the project's final budget was around 800,000 Baht. This budget was relatively small compared to the other government budget that aimed for economic recovery from the COVID-19 pandemic. The implementation of the project has a positive effect on society and new local entrepreneurs who want to use the solar drying plant in product development.

In conclusion, comparing the benefits arising from the project, especially in training and in providing a solar-powered drying facility that outlasts the project life and could continue to be used in future training/usage for at least 3-6 years. It can serve new entrepreneurs who want to develop dried food products in the area. In the future, it could also generate revenue from commercial products for NFE and the community. The benefit from this project thus qualitatively outweighs the cost in terms of environmental and social. The implementation of projects provided environmentally friendly facilities and activities. Food preservation by solar energy reduces food waste and greenhouse gas emissions from electricity used during the drying process, coupled with reducing greenhouse gases from the decay process of food waste. The project promotes and contributes to better environmental quality.

5. Project-Based Recommendations

5.1 Project Cycle Process including Project Design, Planning, and Implementation

The following recommendations on project design/planning and implementation were listed.

- 1) The determination of project objectives should be based on the needs of the project's target audience.

- 2) Clear criteria for selecting project target groups should be developed.
- 3) A brainstorming session should be held to determine the needs of the target audience. This session should also serve as an opportunity for target groups to participate in solving problems that arise during the project implementation.
- 4) There should be activities that encourage or guide the target group to develop dried products during the project implementation.

5.2 Project Outputs, Outcomes, and Impacts on SDGs, NDCs, and BCG Component

The following recommendation on the Project's Outputs, Outcomes, and Impacts

- 1) Project implementation should consider having a mechanism to include small-scale food processors to participate in project activities to share common interests to promote small-scale processed food entrepreneurs and create a network for those who are interested in becoming a new processed food entrepreneur
- 2) A form should record material preparation and uses when using a solar-powered drying house for food processing activities so that the amount of greenhouse gas emission reduction can be estimated.

ANNEX III

**Summary of Comments
from the National Workshop
(Public Discourse)
organized on November 29, 2022
at Chiangkhan River Mountain Resort, Loei Province
and online via Zoom Meeting**

**Summary of Comments from the National Workshop (Public Discourse)
organized on November 29, 2022
at Chiangkhan River Mountain Resort, Loei Province**

Issues addressed in the workshop:

Discussion Questions

- 1- What benefits do you get from projects under the economic and social recovery plan from the impact of the COVID-19 virus?
- 2- What obstacles are you currently facing?
- 3- What are the additional supports for the community to achieve sustainable development?
- 4- How should government policies be adjusted for long-term economic, social, and environmental effects?
- 5- What role should the private sector and civil society play in achieving sustainable development nationally and locally?

The notes and comments from the workshop can be summarized to address in the report as follows:

- 1) The project implementation has been rushed due to the limitation of using budget funds according to the rehabilitation plan. Project design and planning take a mainly top-down approach, with little participation from the areas and no concern about local differences.
- 2) The project design was initially unconcerned about green recovery and did not deliver the ultimate outputs to achieve the outcome.
- 3) Changing farmers' mindsets is crucial for agricultural-based projects, especially OT-ONTAG and KNN. Farmers need to enhance their understanding of the projects and gain knowledge to implement them.
- 4) The project design and planning should specify the indicators that address the outputs, outcomes, and impacts. The KPI must be measurable in terms of project quality rather than quantity.
- 5) Project sustainability is the main issue, especially financial sustainability, to ensure project continuity.
- 6) Various sectors, including the private sector and civil society, should be involved in planning and driving projects for sustainable development, starting at the beginning.
- 7) The project on green recovery should be designed to deliver the outputs to the end users. For example, marketing management should be addressed to encourage green production.

ANNEX IV

**Summary of Comments
from the International Workshop
(Public Discourse)
Organized on January 23rd, 2023
at Amari Watergate, Bangkok, THAILAND
and Online via Zoom Meeting**

Agenda
PAGE (Partnership for Action on Green Economy) Consultation Workshop
Shaping Thailand's Policy Towards Green and Inclusive Recovery and Development
Monday 23rd January 2023 at 2.00-4.30 p.m. (Bangkok Time)
Amari Watergate Hotel Bangkok

Zoom link:

<https://undp.zoom.us/j/87232197113?pwd=K0NkcVArUjFrUC8xWjBlazYvQXpBZz09>

Meeting ID: 872 3219 7113

Passcode: 690719

Language: English

Thai/English interpretation services will be provided.

- 1.30-2.00 p.m. Registration
- 2.00-2.05 p.m. Welcoming Remarks
by Mr. Renaud Meyer
Resident Representative,
United Nations Development Programme (UNDP) in Thailand
- 2.05-2.10 p.m. Welcoming Remarks
by Dr. Ozunimi Iti
PAGE Global Technical Team Member & Industrial Development Officer,
United Nations Industrial Development Organization (UNIDO)
- 2.10-2.15 p.m. Opening Remarks
by Ms. Gita Sabharwal
United Nations Resident Coordinator in Thailand (*TBC*)
- 2.15-2.20 p.m. Remarks
by Representative of the National Economic and Social Development
Council (NESDC) (*TBC*)
- 2.20-3.10 p.m. Shaping Thailand's Policy towards Green and Inclusive Recovery and
Development
by the NIDA Team
Assoc. Prof. Nada Chunsom, Ph.D.
Ms. Priyanut Piboolsravut Dharmapiya, Ph.D.
Ms. Atchara Yomsin, Ph.D.
Asst. Prof. Santi Chaisrisawatsuk
Asst. Prof. Wisit Chaisrisawatsuk
Asst. Prof. Monthien Satimanon, Ph.D.
Asst. Prof. Thasanee Satimanon, Ph.D.
Assoc. Prof. Pakpong Pochanart, Ph.D.
Assoc. Prof. Chutarat Chompunth, Ph.D.
- 3.10-4.20 p.m. Q & A and Discussions
- 4.20-4.30 p.m. Concluding Session

Annex
Projects Evaluated as part of the
PAGE Support for Green and Inclusive Economic Recovery Initiative

The 6 projects under the Government's 400-billion-baht Rehabilitation Fund selected for evaluation are as follows:

i. One Tambon One New Theory Agriculture Group—which aims to strengthen the development of the local community's economy and food security through providing capacity building to farmers to adopt the new theory agriculture and sufficiency economy principles as well as promoting the marketing of agricultural products in each Tambon (subdistrict) throughout the country.

ii. "Kok Nong Na (Land-Water-Rice Field) Model"—which intends to foster the adoption of Sufficiency Economy Philosophy (SEP) in farming practice and livings to meet the SDGs, and the development of Community and Household Lab Model for Quality of Life.

iii. Development of pilot areas for travel safety zone—which focuses on developing pilot areas for safe travel and knowledge on safe travel, and to make a public relation of these pilot areas to foreign and domestic tourists.

iv. Upgrading the economy in the Central-Western Economic Corridor using BCG (Bio-Circular-Green) model—which emphasizes improving agricultural production through applications of technologies and innovation to increase the competitiveness of related industrial processes and reduce costs and environmental impact. It also aims to add values to agricultural products throughout the value chain following the BCG model.

v. Cotton Valley Creation—which promotes community-level cotton industry in Loei Province and hence creates alternative income stream for the local communities.

vi. Processing of dried banana using solar energy in Pang-Nga Province

PAGE (Partnership for Action on Green Economy) Consultation Workshop
Shaping Thailand's Policy towards Green and Inclusive Recovery and Development
Monday 23rd January 2023 Bangkok

	Full Name	Organization
1	Ms.Sooksiri Chamsuk	United Nations Industrial Development Organization (UNIDO)
2	Ms. Suwimol Wattanawiroon	United Nations Industrial Development Organization (UNIDO)
3	Ms.Janthawan Wantanaphong, Ph.D.	National Economic and Social Development Council (NESDC)
4	Dr. Bernd Christiansen	Embassy of the Federal Republic of Germany
5	Ms. Atchara Yomsin, Ph.D.	National Institute of Development Administration (NIDA)
6	Assoc. Prof. Chutarat Chompunth, Ph.D.	National Institute of Development Administration (NIDA)
7	Asst. Prof. Monthien Satimanon, Ph.D.	National Institute of Development Administration (NIDA)
8	Assoc. Prof. Nada Chunsom, Ph.D.	National Institute of Development Administration (NIDA)
9	Assoc. Prof. Pakpong Pochanart, Ph.D.	National Institute of Development Administration (NIDA)
10	Ms. Priyanut Piboolsravut Dharmapiya, Ph.D	National Institute of Development Administration (NIDA)
11	Asst. Prof. Santi Chairisawatsuk	National Institute of Development Administration (NIDA)
12	Asst. Prof. Thasanee Satimanon, Ph.D	National Institute of Development Administration (NIDA)
13	Asst. Prof. Wisit Chairisawatsuk	National Institute of Development Administration (NIDA)
14	Mr. Renaud Meyer	UNDP
15	Ms. Anuk Serechetapongse, Ph.D.	UNDP
16	Ms. Dadanee Vuthipadadorn, Ph.D.	UNDP
17	Mr. Thanawat Wachiratongkum	UNDP
18	Mr. Panupong Plansumrit	UNDP
19	Ms. Nongnuch Boonridruethaikul	UNDP
20	Ms. Phornthira Sripattanatadakoon	Sapiens International Corporation
21	Mr. Kanok Suwanmasit	Sapiens International Corporation

	Full Name	Organization
22	Apinya Panupat	National Metal and Materials Technology Center (MTEC), NSTDA
23	Laurent Lourdais	Delegation of the European Union to Thailand
24	Margaret C. Yoovatana	Department of Agriculture
25	Noramont Intaranont, Ph.D.	Thailand Science Park, NSTDA
26	Pavitra Trinawong	Office of Agricultural Economics
27	Worajit Setthapun, Ph.D	PMU-B
28	คุณกวี จงคองควาภูมิ	มูลนิธิพลังงานเพื่อสิ่งแวดล้อม
29	Prasit Jiyapanichkul	RMUTK
30	Thaksaphun Siphongmanus	Amway Thailand Co.Ltd.
31	Srirana Buadoktoom	Office of Agricultural Economics
32	คุณเบญจรัตน์ พรหลาย	สำนักงานเศรษฐกิจการเกษตร
33	คุณณัฐนัย อนันตรัมพร	บริษัท อินเทอร์เน็ต เทคโนโลยี จำกัด (มหาชน)
34	คุณวัลย์ลักษณ์ ตั้งตติยภัทร์	บริษัท โกลเด้นแพน
35	คุณศรีนวล สุรณี	บริษัท เอสซีบี
36	รศ.ดร. นีรมล สุธรรมกิจ	คณะเศรษฐศาสตร์ มหาวิทยาลัยธรรมศาสตร์
37	คุณสุทัศน์ อัดนิมิตร	ยูนิค
38	คุณมธุรส วัฒนโกเมร	การท่องเที่ยวแห่งประเทศไทย
39	คุณนาฏธิดา ทารวงศ์	การท่องเที่ยวแห่งประเทศไทย
40	Jareevichaya Terdthamathorn	NESDC
41	Orawan Dejkajonwuth	บจก.โมต้ายุโรป้า
42	คุณสุริยา	สันนิบาตเทศบาลประเทศไทย องค์การปกครองส่วนท้องถิ่น
43	ดร.จันทวรรณ วรรณนะพงษ์	สำนักงานคณะกรรมการพัฒนาการเศรษฐกิจและสังคมแห่งชาติ (สศช.)
44	Kanokwan Veerakul	168 idea engineering
45	Thitirat Tankunagon	Neilsen Thailand Co.,Ltd.
46	Sirirat cheetang	Neilsen Thailand Co.,Ltd.
47	Jiraporn Chalearmsiripitak	บริษัท แมคเวลล์ อินเทอร์เน็ต เนชั่นแนล จำกัด
48	Sompot Horapong	Zhong Tian
49	คุณสุสติ โกศลารักษ์	ชันชายนันชันฟลาวเวอร์
50	Natthanich Anantapornkich	Private
51	Srinual Prathuangsuksri	Pin Thai
52	Nopphasit Vimolphuthisak	NT. Group. Co. ltd.
53	Pattarasayapon Jongjamratpan	Nielsen IQ THAILAND CO.,LTD.
54	Nitisan Lowthippayasagun	Nielsen IQ THAILAND CO.,LTD.

	Full Name	Organization
55	Orawan Dejkajonwuth	บจก.โมตั้ยู่โรปะ้า
56	Jirawat tangkijngamwong	Thai timber association
57	Margaret C. Yoovatana	Department of Agriculture
58	Noramon Intaranont, Ph.D.	Thailand Science Park, NSTDA
59	Apinya Panupat	National Metal and Materials Technology Center (MTEC), NSTDA
60	Pavitra Trinawong	Office of Agricultural Economics

**Summary of Comments from the International Workshop
(Public Discourse)
organized on January 23, 2023
at Amari Watergate, Bangkok, THAILAND
and Online via Zoom Meeting**

The research team presented the final report in the workshop and opened to the audience's comments. There were representatives from responsible and national-level government agencies such as the Office of National Economic and Social Development Committee (NESDC), the Ministry of Agricultural and Agricultural Cooperatives, and the Ministry of Higher Education, Science, Research and Innovation.

Issues addressed in the workshop:

Discussion Questions

- 1- What are some additional recommendations for evaluating the project under the Economic and Social Recovery packages from COVID-19?
- 2- Based on the lessons learned from the crisis and this recovery package, what stimulus policies and measures should the government develop for the economy to support sustainable development, green recovery, and inclusiveness simultaneously?
- 3- What are your opinions regarding the recommendation from this research on decentralizing the project planning and implementation stage to the provincial and local levels to respond more effectively to the particular issues and demands in the area?
- 4- Do you have other recommendations for increasing transformative partnerships, especially with the private sector and civil society, in the SDGs and green recovery implementation at the national and local levels?
- 5- Recommendations to enhance the Research and Innovation towards SDGs, NDC, and BCG models.

The notes and comments from the workshop can be summarized to address in the report as follows:

- 1) The results of these studied projects may not address much about the green recovery due to the main objectives of the economic recovery after COVID-19; however, many policies related to the green economy were included in the various ministries' strategic plans. Further studies should address the ministries' long-term plans and policies more, especially the policies of the Ministry of Agriculture and Agricultural Cooperatives.
- 2) The Minister of Agriculture worked with the local and agricultural communities. Some case studies had farmers being the center of implementation--farmers were

the critical actors in the development process. The Ministries have implemented 882 learning centers located all over the country. Further studies may consider working with these learning centers where the sufficiency economy philosophy of His Majesty King Rama 9 is being promoted and how to foster and transform the partnership.

- 3) The Ministry of Agriculture also partners with national committees comprising related ministries, including the Ministry of Interior. Moreover, the Ministry partners with international organizations such as the UN, FAO, and other relevant international organizations. The activities actively participate in climate change and promote initiatives on green partnership.
- 4) Regarding research and innovation, the Department of Agricultural Promotions developed crop research and development and has regional offices promoting green production systems. Moreover, the Ministry worked with SDGs and the BCG model through research and innovation. So, if there is a chance for the Department of Agricultural Promotion to partner with the projects, it would be very welcome.
- 5) Moreover, there are ASEAN bodies related to food security, climate change, and resilience. The Ministry is promoting a more climate, resilient agriculture and food system. Thus, the representatives from the Ministry of Agriculture recommend that the projects consider studying what is happening in the Ministry of Agriculture and Agricultural Cooperatives to have a clearer picture of Thailand's green recovery policy development.
- 6) Thailand is moving toward a carbon-crediting market, and the Ministry plans to scale up projects with all technology development. If the project develops promising technology, then the Ministry hopes that the subsequent pace of the project will be on scaling up.
- 7) NESDC and other relevant agencies may consider summarizing the study's results in simple and easy language to communicate them to the participants, especially the target group of farmers.
- 8) The study results revealed that the main issues were the feasibility study and the target group's involvement in the planning process. Thus, future project development should consider these processes in the project design and planning stage. This would help increase value for money and reduce corruption in project development.
- 9) The Ministry of Agriculture has planned to commercialize the multiplication of these microorganisms. This project may initially help estimate the commercialization possibility of these bio-control products, which produce pesticides, chemical pesticides, and organic fertilizers. The Ministry has already promoted these in the learning centers, helping farmers to learn how to produce their organic fertilizers and pesticides. However, commercialization is still a challenge for them in terms of selling this and conserving biodiversity. The Ministry promoted the conservation of indigenous plants. The germ blossoms in the local

community through gene banking, and so to hope that whatever projects it may be, it has to be designed so that the community has these gene banks in the locality and has put banks in their locality.

- 10) We should not ignore local organizations to get projects stakeholders involved. To localize the implementation of the SDGs, the role of provincial and local governments should be addressed, especially regarding resource allocation.
- 11) This project is an approach that assists the government of Thailand in achieving the SDGs. Regarding the recommendations, feasibility studies need to be done before we can come up with an idea and implement it. It should be proposed as an economically viable project, so we need to put a bit more effort into the feasibility studies.
- 12) It is quite irritated by the recommendation that the Government should foresee some financial schemes to ensure the project's continuity. The excellent idea should be that a project can be pushed or helped to initiate, but in the end, the project should continue to live on its own. Thus, it is not a good idea to initiate projects that constantly need the support of the government.
- 13) The comment on policy coherence does not only mean including the policy of agriculture but also the policy of environment, environmental protection, and biodiversity. All those policy fields are responsible not only for the miniature of agriculture but also for parts of it that fall under the Ministry of Environment's or other ministries' responsibility. All those existing policies should be included when constructing a new project. Thus, thinking about how to do that should be a challenge. There is no one solution for all recipes for that. It depends on the situation and topics that you talk about. For example, we must also include the Ministry of Health when discussing healthy food. So for policy coherence, we should have as many responsible political parties as possible because if we do not include them, they cannot include your project in their future political programs.
- 14) The Ministry of Higher Education, Science, Research and Innovation representative mentioned PMUs (Project Management Units), the research funding agencies. One of the nine funding agencies focused on program management units for human resources and institutional development, research, and innovation. The PMU focused on researcher and human capacity building upskill and reskill. So, based on the recommendation for each project, a capacity-building element of human resource development is essential. Moreover, there is no one-size-fits-all training. Thus, each project does not have just one type of capacity building. It has to be training across the value chain. Most of the evaluated projects focus on production but not so much on completing the value chain where the market is. Working with the local SMEs and the farmers, the process should end in the market, not just the production, which is known quite well how to produce. Thus, the project should start with who will buy the stuff instead of how we will capacitate the local or the area-based.

ANNEX V

UNEP POLICY REPORT THAILAND: STATE OF GREEN RECOVERY

Thailand: State of Green Recovery

Policy Brief

Summary

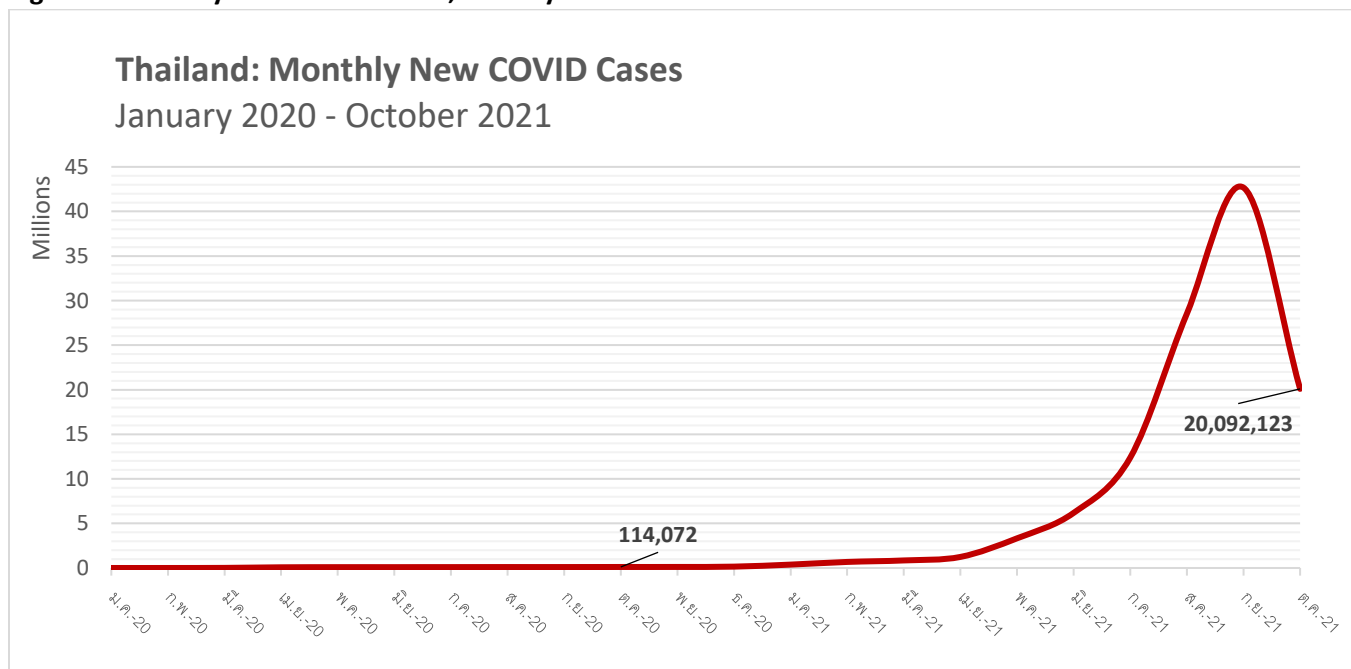
Thailand recently experienced its worst wave of the pandemic. In addition to dire health consequences, the need for cash transfer schemes and other fiscal stimulus during the pandemic has exacerbated Thailand's already high debt-to-GDP ratio. Thailand has yet to devote much spending towards recovery measures, likely due to these overlapping public health and fiscal crises. Despite these challenges, Thailand has committed to transition towards a Bio-Circular Green Economy (BCG), is taking action to foster sustainable finance, and has verbally committed to stick to its NDC, SDG, and post-2020 biodiversity targets. Green fiscal policy measures provide innovative options for Thailand to create more fiscal space and jumpstart economic recovery, while also building a path towards a circular, clean, and green economic system. However, calculated and coordinated fiscal planning involving inputs and buy-in from various government stakeholders is necessary for such policies to be designed and implemented successfully.

COVID Situation in Thailand

Health Impacts

In January 2020, Thailand became the second country in the world to confirm a case of COVID-19 infection. Thailand is experiencing its deadliest phase of the virus so far. For most of 2020, Thailand's new COVID-19 infections stayed low.ⁱ As of October 2020, Thailand had experienced less than 4,000 total cases and only 59 deaths.ⁱⁱ

Figure 1: Monthly New COVID Cases, January 2020 – October 2021ⁱⁱⁱ



Thailand has experienced a worrying surge in COVID cases over the summer and fall of 2021, with millions of confirmed cases, and many lives unfortunately lost.

Most people dying of COVID-19 in Thailand are unvaccinated or have received only one dose of vaccine. While vaccination rates have picked up, as of September 2021 vaccination rates among the country's elderly population are not high enough. The likelihood of someone aged 60 and over dying of COVID-19 was 14 times higher than for someone below 60.^{iv}

Economic Impacts

The pandemic has also wreaked havoc on the Thai economy, creating concurrent fiscal and current account deficits. By August 2020, eight months after Thailand's first confirmed COVID case, the Thai economy had contracted by over 8%.^v The country's GDP fell by over 6% in 2020, and many workers lost their jobs.^{vi}

Prior to the pandemic, Thailand accumulated 1.8 trillion baht (55 billion in current USD) in debt between 2014 and 2019. Thailand's 1.9 trillion baht (59.7 billion USD) bailout in May 2020 more than doubled this debt.^{vii} Despite the Thai debt-to-GDP ratio ballooning from 41% in 2019 to 49.6% in 2020,^{viii} it still remained below 60%, the legal limit imposed by the country's Fiscal Responsibility Law.^{ix} In February 2021, the Thai government approved additional COVID spending that pushed the country's debt-to-GDP ratio to 56.74%.^x Forecasts suggest that Thailand is heading towards a current account deficit of 2% of GDP in 2021.^{xi} In addition, the baht has fallen 10.2% in 2021, trading near a three-year low. Due to the country's twin deficit, the government may be forced to raise Thailand's debt-to-GDP ratio to 70% in late 2021.^{xii}

Environmental Impacts

During the pandemic, there were noticeable improvements in air quality (namely, a reduction in PM_{2.5} and NO₂) and transboundary haze pollution. Such decreases are attributable to the social restriction of work from home, which resulted in a drastic decline in the number of vehicles on the road.^{xiii} In addition, there was a decrease in municipal waste in urban areas.^{xiv} Thailand's environment and natural resources have also benefited from the pandemic. Closure of wildlife conservation areas and reserves allowed nature to recuperate, with endangered species and animals being seen the country's forests and seas.^{xv}

However, forest fires (caused by a combination of land burning for commercial crops and persistent dry conditions exacerbated by climate change) and the operation of coal and gas power plants during the lockdown period caused respirable particulate matter (i.e. PM₁₀) concentrations to stagnate throughout the country and NO₂ concentrations to stay the same in northern Thailand.^{xvi} This trend is likely to continue as declines in domestic power demand lead Thailand to reduce its imports of electricity.^{xvii} There were also increases in plastic waste^{xviii} and food waste,^{xix} coinciding with high demand for online delivery services, single-use plastic products from food deliveries, and sanitizers and water bottles.^{xx} Contaminated medical waste has also spiked.^{xxi}

Thailand's Structural Vulnerabilities

Thailand's economy is heavily dependent on external demand, particularly tourism and exports. The tourism and automotive industries have been the most impacted – together, they account for over ¼ of the country's GDP. Tourism accounts for nearly 22% of GDP and 20% of employment,^{xxii} and about half of the country's tourists are foreign visitors.

Thailand's labor force is also particularly vulnerable. Employment in Thailand was expected to be negatively impacted by COVID, threatening household financial sustainability. Up to 7.5 million jobs were predicted to face disruption, and the share of the working poor was expected to increase to at least 11% of total employment.^{xxiii}

Trends in Thailand's agricultural sector employment have been exceptionally stark. At the onset of the pandemic, more than one million workers left the sector over the course of two quarters (Q4 2019 and Q1 2020).^{xxiv} Employment in agriculture declined by 10.9% between Q1 2020 and Q1 2021, despite employment in all other sectors increasing by 2.5%.^{xxv} This situation was exacerbated by Thailand's worst drought in 40 years.^{xxvi} Agriculture accounted for 91.3% of the country's informal economy employment in 2019^{xxvii} and 31% of total employment.^{xxviii} In Q1 2021, the agricultural sector grew by just 0.1 percent despite rising global agricultural prices.^{xxix} Recently, however, agricultural product prices have risen considerably, attracting workers to relocate to this sector.^{xxx}

Household-level hardships in Thailand are especially concerning given the fact that, on average, Thai households have more debt than financial assets. In addition, half of the country's workers are informal and not covered by social safety

nets. The richest 1% controls almost 67% of Thailand’s wealth – the largest wealth gap in the world.^{xxxii} Inequality between poor and middle-income households is growing, according to research by the Thailand Development Research Institute Foundation.

Environmentally, Thailand faces increasing environmental degradation in many regions, including biodiversity loss, declining wildlife populations, deforestation and desertification. Water scarcity, air and water pollution, and climate change are other emerging environmental challenges.^{xxxiii} Thailand was the 8th most climate-affected country in the period 1999-2018, per the Global Climate Risk Index.

Thailand’s Structural Strengths

The Thai government provides near-universal health financing coverage, allowing the government to offer free COVID-19 tests, medical care, and vaccines.^{xxxiii} According to the 2019 Global Health Security Index, Thailand is among the top 10 most prepared countries and ranks first among all upper middle-income countries.^{xxxiv}

The pandemic has evidenced Thailand’s wealth of social capital. While half of the country’s workers are informal and thus lack social safety nets, civil society has effectively delivered social assistance to the needy. Daily broadcasts of hospital supply shortages have been met with in-kind and cash donations from temples, NGOs, relief associations, civic groups, and individuals.

Thailand’s financial sector has weathered the pandemic well, expanding its share of the country’s GDP in 2020.^{xxxv} This suggests that Thailand can leverage its strong financial system to catalyze a green COVID recovery. The Thai government’s draft budget for fiscal year 2022 has seen a decrease of 47% in funding for the Ministry of Natural Resources and Environment.^{xxxvi} However, there are still ample opportunities to enhance the allocation and generation of scarce public resources. Properly tuned fiscal policies will underpin continued progress on environmental sustainability by setting proper incentives and pricing signals, crowding in private sector investment, and ultimately catalyzing a green recovery.

SDGs, NDC, and post-2020 Biodiversity Strategy

Sustainable Development Goals

The Thai government has integrated the SDGs in the country’s 2017-2036 National Strategic Plan as well as the 12th National Economic and Social Development Plan (2017-2021). The National Committee for Sustainable Development (CSD), chaired by the Prime Minister, represents the central mechanism to advance all 17 Goals.^{xxxvii} The SDGs align with Thailand’s Sufficiency Economy Philosophy (SEP), which was integrated in national planning starting in 2002 and promotes moderation, reasonableness and resilience.^{xxxviii}

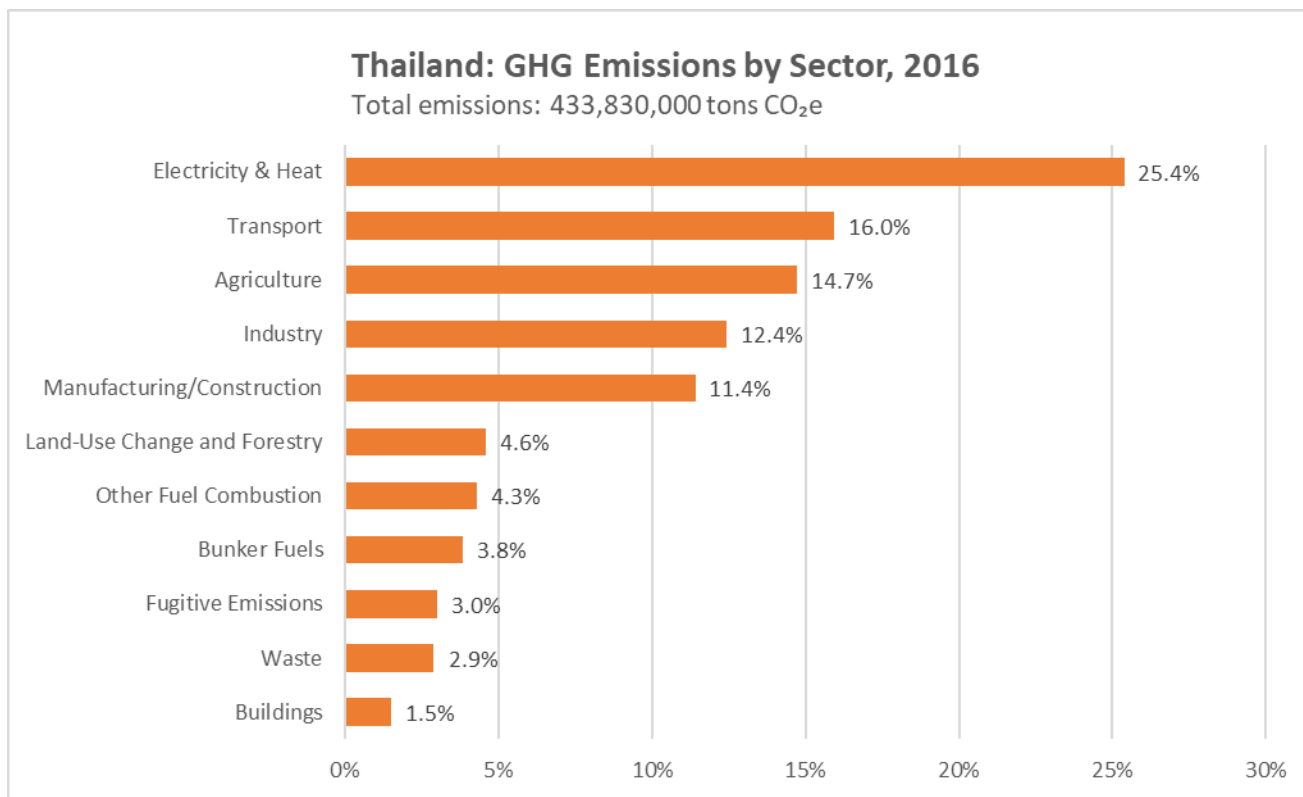
However, the COVID-19 pandemic and its associated impacts have severely hindered further progress on the SDGs.^{xxxix} Thailand believes its Bio-Circular-Green (BCG) Economy Model will drive sustainable economic growth in the future, while preserving the unexpected environmental gains during the pandemic. Thailand’s BCG model is an application of the SEP and intends to foster an inclusive economy aligned with the SDGs.^{xl}

Nationally Determined Contribution

Southeast Asia is one of the most climate vulnerable regions of the world. The region’s economy could lose 28 trillion USD over the next 50 years if it does not significantly reduce carbon emissions. Among these losses, manufacturing and tourism – two of Thailand’s major economic sectors – will be impacted particularly hard.^{xli} On the other hand, if Southeast Asia steps up efforts on climate change, it could gain \$12.5 trillion in GDP and an average year-on-year GDP growth of 3.5% for the next 50 years.

Climate change adaptation and mitigation are both government priorities and becoming deeply embedded in governmental structures. Thailand explicitly notes that the “New Normal” emerging from the COVID pandemic will

reshape economy and social activities, and the Thai government “aims to use this opportunity to build back better an ecosystem and economy that promotes climate-resilient and sustainable development.”^{xlii}



Electricity and Heat, Transport, and Agriculture are Thailand’s top emitting sectors, accounting for 25.4%, 16.0%, and 14.7% of the country’s total emissions, respectively.^{xliii xliiv} These are sectors Thailand should target through green fiscal policy, sustainable finance, circular economy transition policy, and other green economy strategies. For the energy sector, Thailand has initiated feed-in tariffs, tax incentives and access to investment grants and venture capital to promote renewable energy and energy efficiency.^{xliv} Finance, technology development and transfer, and capacity building are described by the Thai government as crucial means of implementation for Thailand’s NDC.^{xlvi}

As of August 2021, the Thai government is reportedly producing a national masterplan for presentation at COP26 with a goal of achieving net zero emissions. Proposed government action includes support for more low carbon power generation, the electric vehicle industry, and the circular economy.^{xlvii}

Convention on Biological Diversity

Thailand is one of the most biodiverse countries in Southeast Asia. However, its natural wealth is being threatened on various fronts. agribusiness and demand-driven illegal timber harvesting have threatened the country’s natural capital.^{xlviii} In 1961, Thailand had a lush forest covering 53.35% of the country. However, by 2009, terrestrial forest coverage decreased to 32.1% of the country.^{xlix} Between 2001 and 2020, Thailand lost 11% of its total tree cover.^l Mangrove forests are threatened by illegal wood cutting, shrimp farming, construction of residential areas and industrial factories. Beach forests have been heavily devastated due to tourism, community settlement and port activities.^{li} Thailand’s flora and fauna are also grappling with illegal poaching, including wildlife trade, and consumption.^{lii} Biodiversity is essential to human health and climate resilience. Loss of biodiversity and ecosystem integrity – together with climate change and pollution – undermine efforts on 80% of assessed SDG Targets, making it even more difficult to report progress on poverty reduction, hunger, health, water, cities and climate.^{liii} There are clear environmental, social, and economic incentives for Thailand to protect and promote its valuable biodiversity.

As a Contracting Party to the Convention for Biological Diversity, Thailand devised an Action Plan on Biodiversity Management (2017-2021) which has been largely effective, as shown in Figure XX.

On track to exceed target	12% (3 of 25)
On track to achieve target	52% (13 of 25)
Progress towards target, but at an insufficient rate	36% (9 of 25)
Not significant change	0%
Moving away from target	0%

Thailand recognizes the important environmental role performed by watersheds, river basins and coastal areas, as well as their significance in supporting livelihoods linked to fisheries, recreation and tourism, among many others.^{lv} In October 2020, the Thai Prime Minister stated his commitment to protecting the country’s biodiversity and natural resources. As part of this effort, Thailand’s national parks will close for three months every year to allow natural resources to recover.^{lvi} However, none of Thailand’s COVID spending has explicitly gone towards biodiversity or natural capital.

Existing Policy Opportunities for a Green Recovery

Thailand’s Bio-Circular Green Economy Model

In June 2020, the Thai government launched the Bio-Circular Green Economy Model (BCG).^{lvii} Under this model, the Thai government is committing to the principle that economic development should begin with producing from existing resources, strengthen local foundations, create balanced, stable growth, and generate a self-sufficient economy. This will lead to more efficient use of natural assets and a minimized environmental impact. The BCG Model will leverage the country’s robust agricultural sector, competitiveness in biotechnology, and growing pool of skilled workers.

There are four strategic areas being targeted by the BCG Model: (1) Food and agriculture, (2) Medical and wellness, (3) Energy, materials, and biochemicals, and (4) Tourism and the creative economy. These economic areas are considered Thailand’s economic foundation and strengths.^{lviii}

Under the BCG Model, In 2020, Thailand’s Eastern Economic Corridor initiated projects to develop research capacities, development, and innovation capacities for the agricultural sector, biotechnology, technology for new types of crops, environmentally-friendly aquaculture systems, testing kits ^{lix}

Sustainable Finance Policies

In July 2020, the Thai government developed a Sustainable Financing Framework under which it intends to issue green, social and sustainability bonds and loans, and use the proceeds to finance and refinance, in whole or in part, existing and future government loans or expenditures in the form of direct investment expenditures, subsidies, fiscal measures and operational expenditures. Proceeds from these financing instruments can be used to fund government expenditures, subsidies, and fiscal measures.^{lx}

In August 2021, Thailand’s Working Group on Sustainable Finance (consisting of the Fiscal Policy Office, the Bank of Thailand, the Securities and Exchange Commission, the Office of Insurance Commission, and the Stock Exchange of Thailand) published the Sustainable Finance Initiatives for Thailand (SFIT).^{lxi} These initiatives are intended to form the foundation of a sustainable finance ecosystem and the transformation to a sustainable economic model.^{lxii}

The SFIT includes no mention of the Thai government’s Bio-Circular Green Economy Model. Given the government vocal public advocacy surrounding the BCG Model, it remains to be seen if and how these two policy agendas will be linked. However, one of the Key Strategic Initiatives (KSIs) suggested by the SFIT is the development of a practical taxonomy outlining which economic activities deemed environmentally sustainable and in alignment with Thailand’s sustainability

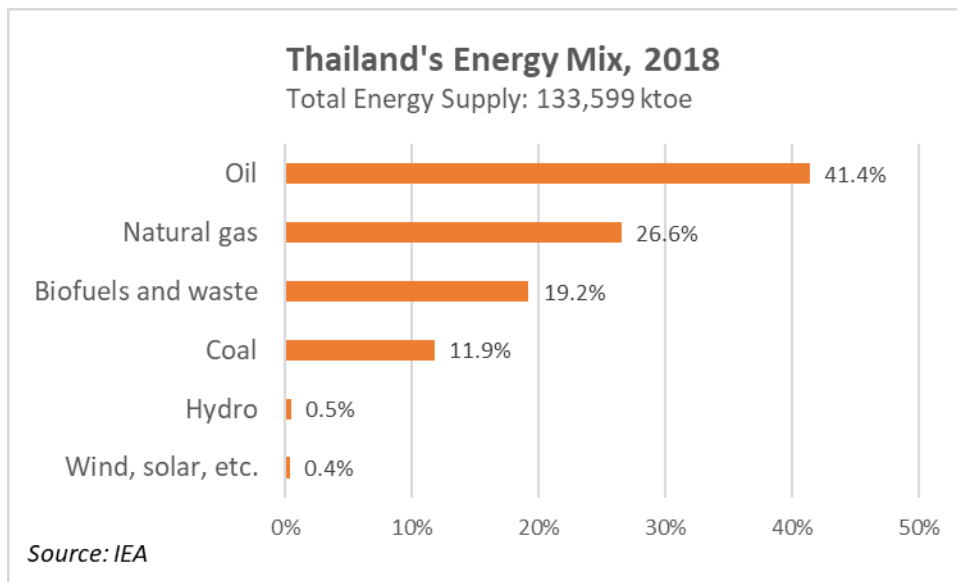
goals.^{lxiii} Here, there is the potential for the Working Group on Sustainable Finance to make explicit mentions of circular economy projects as a subset of sustainable finance efforts.

Thailand's Working Group on Sustainable Finance should coordinate closely with other government agencies to ensure that sustainable finance strategies are implemented within an enabling fiscal policy environment. Green fiscal policies can provide incentives that shift production and consumption behaviors towards more sustainable, greener practices.^{lxiv} Fiscal spending on sustainable finance can create market demand; government investment in green jobs or training programs can build human capital. Environmental taxation can shift investment demand towards greener sectors and projects.

Clean Energy Targets

The energy sector is the biggest emitter in Thailand and renewable energy development is part of Thailand's climate mitigation strategy. Thailand's energy sector is making efforts to reduce emissions but encountering hurdles.

Figure 3: Fossil fuels represent 80% of Thailand's energy mix. Hydro, wind, and solar account for about 1%.



As shown in Figure 3, about 80% of the country's energy generation came from fossil fuels. The country's liquid natural gas (LNG) reliance, which accounts for more than ¼ of energy generation, is particularly entrenched. LNG was originally sourced from reserves in the Gulf of Thailand found in the 1970s, fostering the country's now massive petrochemical and plastics industry. These industries, along with depleting domestic reserves, have made Thailand more and more reliant on LNG imports.^{lxv}

Prior to COVID, Thailand committed to cut its emissions by 20 percent of its emissions by 2030. As part of this effort, Thailand sought to increase the share of renewables (excluding hydropower) to about 20 percent by 2037. This was an ambitious commitment; as of 2019, renewables accounted for less than 1% of the country's electricity generation.^{lxvi} However, there is a possibility that the pandemic will stymie this ambition, especially given the lack of strong focus on emission mitigation in existing development plans.^{lxvii}

Thailand's Green Recovery Efforts

According to Global Recovery Observatory data, Thailand has invested only 3.35% (about 0.83 USD billion) of its pandemic spending in recovery efforts. Out of this, it has not invested any recovery spending on projects that will have a green impact. However, none of this spending is anticipated to have a significant negative environmental impact, either.

Figure 4: Pandemic Spending in Thailand, January 2020 – August 2021

Archetype	Description	Rescue or Recovery?	Green?	Spending (USD Billion)	%
G	Targeted welfare cash transfers	Rescue	No	\$14.69	59.2%
C	Liquidity support for start-ups and SMEs	Rescue	No	\$5.90	23.8%
B	Liquidity support for large businesses	Rescue	No	\$1.68	6.8%
F	Direct provision of basic needs	Rescue	No	\$0.96	3.9%
J	Healthcare services support	Rescue	No	\$0.74	3.0%
S	Tourism and leisure industry incentives	Recovery	No	\$0.71	2.9%
X	Worker retraining and job creation	Recovery	No	\$0.07	0.3%
R	Targeted recovery cash transfers	Recovery	No	\$0.05	0.2%
T	Electric vehicle incentives	Recovery	Yes	\$0.00	0.0%
φ	General research and development investment	Recovery	No	\$0.00	0.0%
Q	Other tax cuts and deferrals	Rescue	No	\$0.00	0.0%
H	Job continuation support	Rescue	No	\$0.00	0.0%
N	Business tax cuts	Rescue	No	\$0.00	0.0%
M	VAT and other goods and services tax cuts	Rescue	No	\$0.00	0.0%

Source: Global Recovery Observatory

As illustrated in **Figure 4**, most of Thailand’s fiscal spending has gone towards targeted cash transfers and liquidity support for small businesses. This rescue spending is prudent as it seeks to address the aforementioned financial vulnerability of indebted Thai households and smaller enterprises. However, none of Thailand’s fiscal stimulus or tax relief to businesses has come with green incentives or requirements.

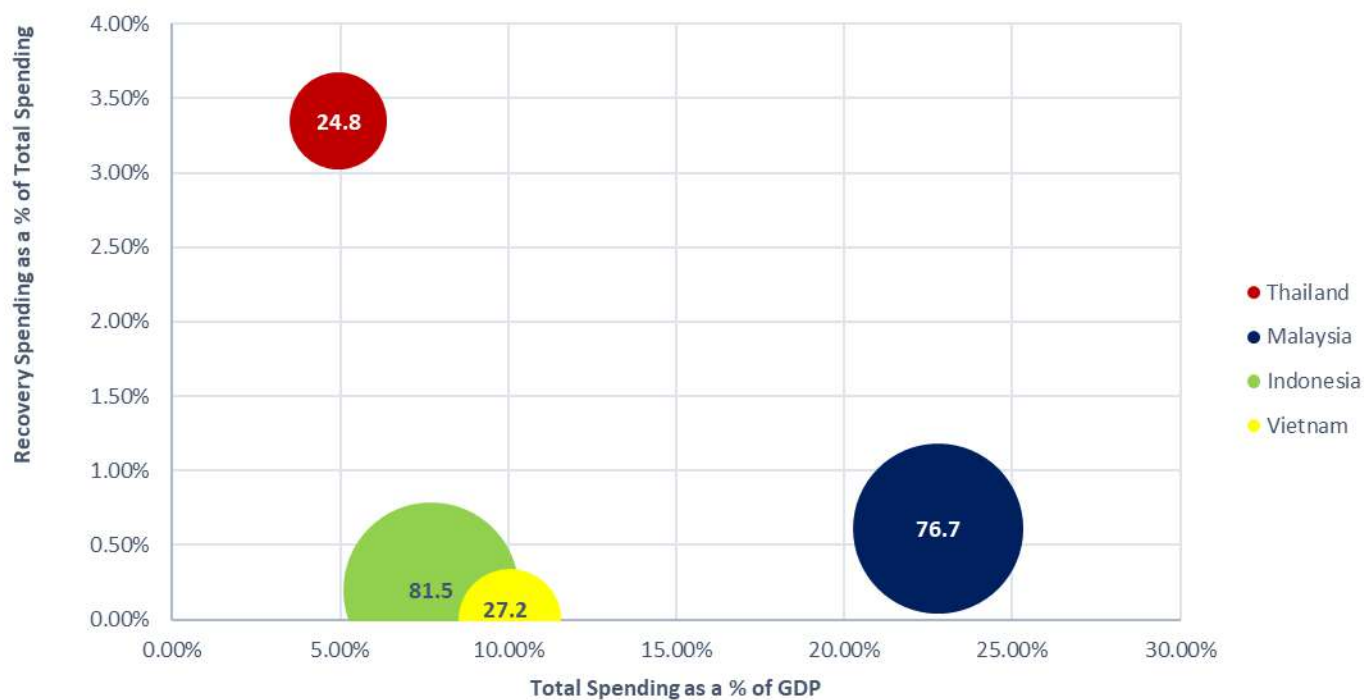
According to GRO data, between Thailand, Vietnam, Malaysia, and Indonesia, there has been no fiscal spending on green recovery efforts. Although only 30 million USD has been spent on policies anticipated to be explicitly environmentally harmful, “status quo” investments with a neutral effect on the environment are sub-optimal given the urgent need to reduce emissions, biodiversity loss and pollution.

However, the Thai government has announced EV investment incentives that, while not supported by fiscal spending, are intended to foster a greener economy. As part of this policy, the Thailand Board of Investment will provide incentives covering all types of electrical vehicles, specifically passenger cars, buses, trucks, motorcycles, three-wheelers, and ships. Incentive programs include corporate tax income exemptions with a THB 5 billion minimum investment and R&D investment.^{lxviii} This policy is aligned with Thailand’s target of 20% emission mitigation by 2030.

Figure 5: Compared to others in the region, Thailand has spent a greater share on recovery efforts.

COVID Spending, January 2020 - August 2021

Spending amounts in USD billions



Source: Global Recovery Observatory

Thailand's biggest Recovery Spending policy overall is a THB 210.2 billion (USD 7.01 billion) cash handout scheme covers to about 31.1 million people (i.e. self-employed persons, farmers, and welfare card holders) to boost household consumption and private sector investment.^{lxix} There are no green conditions attached to these cash transfers.

As depicted in **Figure 5**, Thailand has devoted about 3.5% of its pandemic spending towards recovery efforts. This is a high percentage compared to others in the region. However, globally, recovery spending has accounted for about 16.75% of total pandemic spending.

As a country begins to shift attention from short-term rescue measures to recovery, the largest window for green spending opens.^{lxx} The fact that Thailand has dedicated a relatively small amount of pandemic fiscal spending towards recovery efforts implies that its recovery spending plans and priorities are not yet set in stone.

Figure 6: COVID Spending, Thailand vs Global (January 2020 – August 2021)

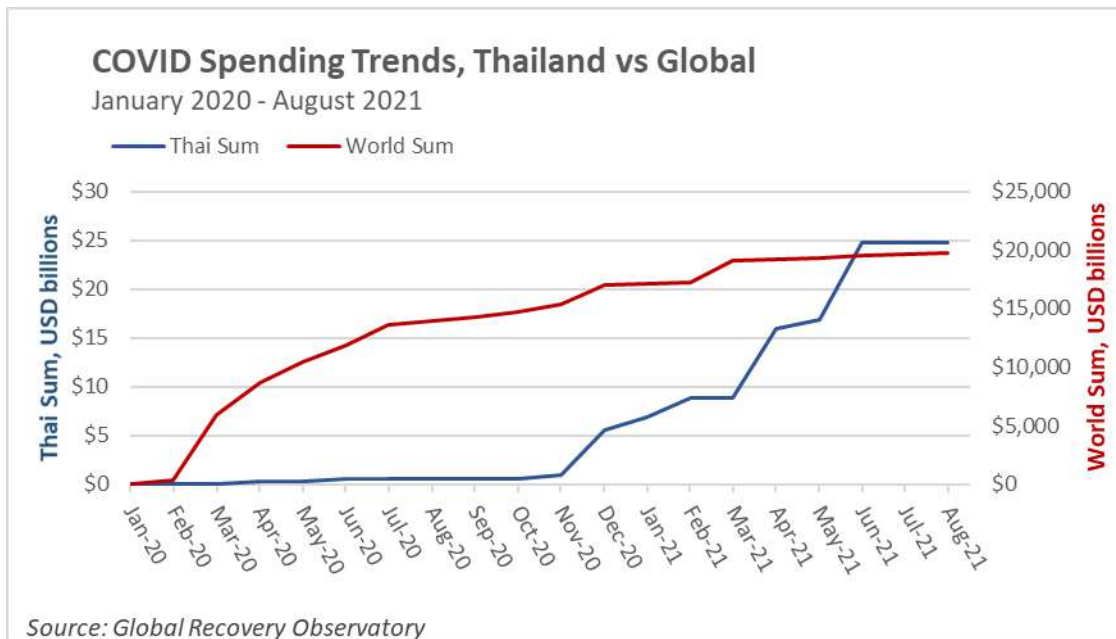


Figure 6 illustrates that Thailand’s COVID spending accelerated starting in December 2020, with strong fiscal stimulus in April and June 2021. In comparison, global spending spiked the most between February and July 2020. Thailand unfortunately continues to grapple with some of the worst health and economic effects of the pandemic, making rescue spending a continued focus. Thailand’s recovery spending window has yet to fully open, meaning there is ample opportunity to make the case for recovery spending to be green when it does come to the top of Thailand’s policy agenda.

The Way Forward: Fiscal Policies for a Green Recovery

Near-term economic recovery in Thailand is being challenged by the ongoing and devastating third wave of the pandemic. As this third wave of infections has evidenced, accelerating vaccinations is the most promising means to end the pandemic and lay the groundwork for a strong recovery.^{lxxi} To adapt to dynamic health and socioeconomic circumstances, the Thai government must carefully and flexibly coordinate the country’s fiscal, monetary, and financial sectors.

The performance and resilience of the Thai economy depend on the health of the natural environment and ecosystems. But prior to the pandemic, economic growth in Thailand was traded off against natural resources and the health of the environment.^{lxxii}

To build back better together, Thailand should make sure rebooting the economy aligns with efforts to reduce GHGs and air pollution which jeopardize lives.^{lxxiii} This will pull people out of poverty, create more jobs, and reduce economic disparities. It will also help reduce the probability of future pandemics and broader environmental and climate change risks.^{lxxiv} Fiscal policy, taxation and public spending are important tools for a transition towards a low-carbon, climate resilient economy.^{lxxv} Investing in measures that simultaneously bolster the country’s economic and environmental health would be in the country’s best long-term interests.

Investing in Natural Capital and Biodiversity

Thailand must ensure the recovery and the re-start of the economy does not accelerate biodiversity loss or further environmental degradation.^{lxxvi} One way to do this is by increasing the application of biodiversity-related taxes to ensure that externalities accurately reflect the cost of biodiversity loss.^{lxxvii} Thailand should also ensure that loans, grants and guarantees to bailout companies that have a heavy biodiversity footprint (e.g. airline and coal companies) are provided with environmental conditions.^{lxxviii}

Fiscal spending on natural capital and biodiversity, such as reforestation efforts and coastal restoration programs, produces jobs at a low fiscal cost while also protecting vital ecosystem services.^{lxxxix} A number of countries have introduced fiscal measures to address unemployment and boost economic activity, while also supporting biodiversity and natural capital.^{lxxx} In Thailand, natural capital projects could provide temporary employment for the more than 2 million Thai people who have lost tourism sector jobs during the pandemic.^{lxxxix} A \$1M annual outlay in forest management can generate 500-1,000 jobs in many developing countries. In addition, nature-based solutions create jobs more than 10 times faster than fossil fuel investment.^{lxxxii} Such investment could be a green alternative to current cash transfer schemes.^{lxxxiii}

Investing in natural capital would also represent an investment in the labor and capital assets vital to Thailand's wounded tourism industry. Given the fact that the country's beaches, forests, and other ecosystems are renowned attractions to foreign visitors, it is in the Thai government's best interest to invest in the maintenance of these environmental assets.^{lxxxiv} An investment in tourism quality over quantity could spur green economic transformation in this sector and balance Thailand's current account deficit while also preserving natural capital.

Environmental Taxation

Environmental taxes in particular, can be an effective way to introduce economic, social and environmental costs into pricing and direct capital investment towards green and sustainable technologies. Introducing and ramping up taxes on environmentally harmful activities during the pandemic would deliver dual benefits. Firstly, it would provide a clear economic signal to help drive the transformative changes needed to halt biodiversity loss. Secondly, the additional revenue could help offset increased government spending and reductions in other tax revenue (e.g. labor tax) resulting from the COVID-19 induced economic crisis.^{lxxxv} Such action is also underlined as a viable fiscal relief strategy in *Thailand's Voluntary National Review on the Implementation of the 2030 Agenda for Sustainable Development*.^{lxxxvi}

The pandemic has constrained Thailand's fiscal space and created conflicts between economic growth, environmental protection, and human health. Environmental taxes are a demonstrably promising instrument to tackle each of these challenges.^{lxxxvii} Promoting a green economy is a stated goal of the 2022-2026 tax restructuring draft plan being prepared by Thailand's Fiscal Policy Office.^{lxxxviii} In 2019, Thailand had a tax revenue to GDP ratio of 21.16%, higher than Indonesia, Malaysia, and Vietnam.^{lxxxix} However, this ratio is relatively low compared to OECD countries and has dropped further due to the pandemic.^{xc} Thailand currently generates none of its tax revenue from environmentally related tax revenue, according to the OECD.^{xc} Environmental taxation could both promote a green economy while widening Thailand's fiscal headroom.

Reform of Environmentally Harmful Subsidies: Agriculture, Fisheries, and Fossil Fuels

Careful reform and reallocation of subsidies in Thailand could allow the Thai government to divert public finance to more beneficial and sustainable development objectives. Reducing government spending on environmentally harmful subsidies would support Thailand's transition to a green economy while also freeing spending for use on COVID recovery and the SDGs.

Agricultural Subsidies

Thailand's agricultural sector can provide green economic opportunities in the wake of the pandemic. Agriculture in Thailand employs 30% of the country's workforce, and maintaining productivity in the agricultural sector is important for rural income and growth.^{xcii} In addition, this sector is highly vulnerable to climate change.^{xciii}

As Thailand seeks to recover economically from the pandemic, it should ensure that its COVID stimulus in the agricultural sector provides positive or negative incentives for farmers to implement sustainable practices. Among current COVID spending measures, Thailand has extended 290 million in support for oil palm growers and rice farmers.^{xciv} Without environmental conditionality, agricultural subsidies can promote farming practices that are ecologically and economically unsustainable.^{xcv}

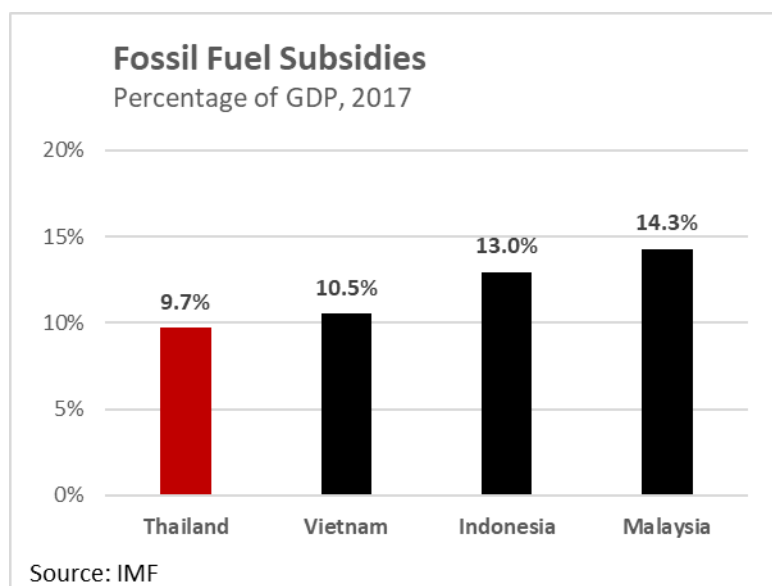
To adapt this key sector to climate change and promote a green recovery, the Thai government should attach green incentives to fiscal stimulus and provide further support for climate smart agriculture technology, precision farming, improved plant, animal, and fishery climate resilience, and agricultural early warning systems.^{xcvi} For example, investment in the “Khok Nong Na” Model of diversified cropping could spur grassroots development, build climate resilience, and instill values of environmental conservation.^{xcvii}

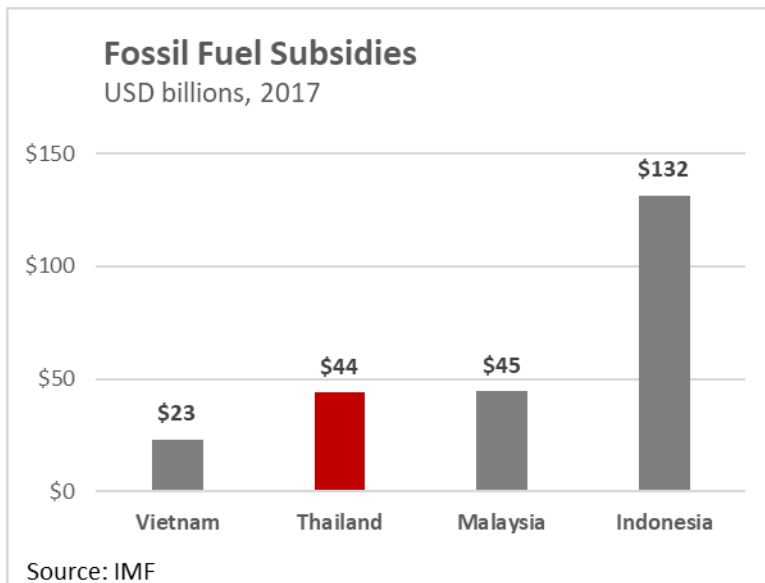
Fishery Subsidies

Fishery subsidies that artificially increase profits or reduce costs contribute to overfishing. Overfishing is both environmentally and economically harmful, inhibiting the profit gains of fishing from larger, more mature and sustainably-caught fish populations. Subsidies also foster inequality, as they disproportionately fund big business rather than small-scale and artisanal fisheries.^{xcviii} Fossil fuel discounts for fishing vessels also contribute to climate change and ocean pollution. Thailand provides the 7th largest amount of fishery subsidies in the world, totaling about 1.15 USD billion in 2018.^{xcix} The Thai government could reform these subsidies to promote sustainable, small-scale fishing practices, thus promoting both socioeconomic and environmental sustainability.

Fossil Fuel Subsidies

Figure 7: Fossil Fuel Subsidies in Thailand and the Region, 2017





Fossil fuel subsidy reforms can generate substantial environmental benefits, such as reductions in CO₂ emissions and premature deaths from air pollution. The use of fossil fuels, and their promotion through subsidy schemes, inhibits government efforts to reduce poverty, improve health, reach gender equality, provide access to energy, and address climate change.^c

Thailand subsidizes fossil fuels as a percent of GDP less than others in the region. However, reducing fossil fuel subsidies still represents an opportunity to free an additional 44 USD billion in fiscal space.^{ci}

Carbon Pricing

The introduction of carbon pricing in Thailand could also drive emissions reduction and a clean energy transition. The National Climate Change Master Plan (2015-2050) refers to carbon markets as a potential GHG reduction mechanism.^{cii} From 2015-2020, Thailand operated a Voluntary Emission Trading Scheme, providing carbon market knowledge, capacity, and a legal framework.^{ciii} Fully implemented carbon pricing would help accelerate a transition to low-carbon energy, particularly in the power sector. According to IEA modeling and policy insights, a moderate carbon price would reduce emissions through a dispatch shift from coal-to-gas generation^{civ} while still maintaining contractual obligations and system reliability.^{cv}

Renewable Energy Investment

In Thailand, government investment in rooftop solar and net metering could lessen the need for the government to provide near-term economic stimulus to households, promote long-term solar industry growth, and put Thailand on track to meet its NDC emission reduction benchmarks.

Per Greenpeace calculations, if the Thai government invested 98,859 million baht (3.025 billion USD) in rooftop solar capacity building, they could enhance capacity by 2,778 MW.^{cvi} Within this scheme, net metering systems for households would provide a new income stream for Thailand's Covid-battered public coffers. In addition, per year electricity savings would be 18,628 million baht, leading to a return on investment in less than 5.5 years.

Over a 25 year timeframe, the benefits to the public would amount to 465,689 million baht (14.249 USD billion). This conservative figure does not include the additional economic co-benefits of renewable energy investment (e.g. job creation, public health cost savings, etc).^{cvii}

At the final stage of their lifespan, solar panels can be recycled to salvage materials such as glass, aluminum, copper, etc. Approximately 85% of the materials can be reclaimed, implying that solar panel recycling plants would be another promising front for investment in Thailand's clean energy and circular economy goals.^{cviii}

Circular Economy Transition

Stimulating the growth of and transition towards a circular economy should be a focus of governments' post-pandemic economic support programs. A 2020 UNEPFI report *Demystifying Circular Economy Finance* details how governments can undertake strategies and actions to accelerate financing of the transition towards a circular economy, manage related risks, and scale up innovation and opportunities. When financing a circular economy, it is crucial for government to provide incentives and an enabling policy framework. The UNEPFI report outlines specific circular economy opportunities and strategies for the following sectors:

- Chemicals and plastics
- Manufacturing
- Industrial agriculture
- Electronics
- Real estate and construction
- Fashion and textiles
- Mining
- Energy

Examples of Fiscal Reforms for a Circular Transition

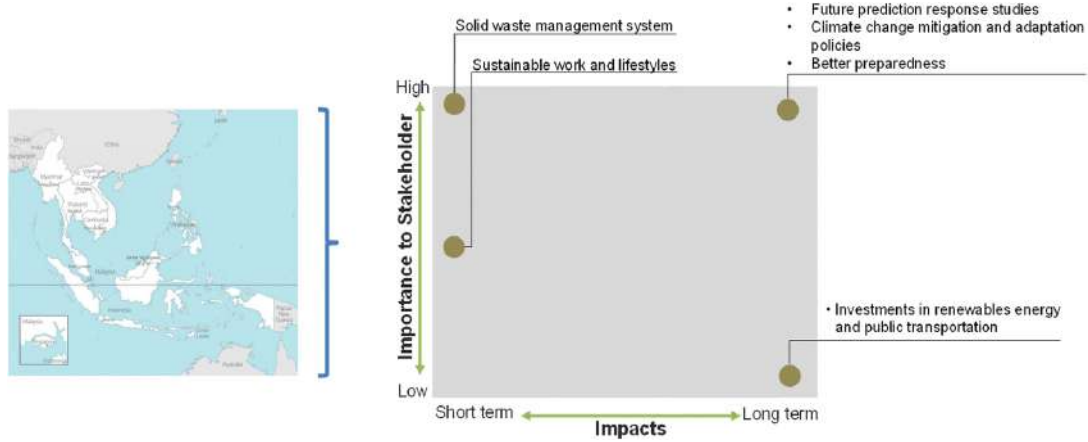
- **Taxing resources rather than labor.** Disproportionate taxes on labor reinforce conventional, linear business models.^{cxix} For example, in 2019, VAT in Thailand was 7%, whereas personal income was taxed at 35%.^{cx} Reducing taxes on labor and favoring taxes on resources can spur businesses to undergo circular transitions. In addition, environmental taxation of resources is harder to evade than taxing labor, especially in countries where activities can easily shift from the formal to informal sector.^{cxii}
- **VAT reform.** Value added taxes (VAT) do not currently differentiate between new products/materials and circular ones. VAT also create high upfront costs for companies that purchase products to be leased to customers. CE-minded VAT reform can stimulate a transition towards circularity.^{cxii}

Fiscal policies can be implemented or reformed in ways that support a CE transition.^{cxiii} For example, taxes (e.g. on resource extraction and single-use plastic production) and public spending (e.g. grants for reuse and repair business models) can de-risk green investments and create a virtuous cycle that will nudge business and investors towards a circular economy.^{cxiv} To stimulate investment in a circular economy, the Thailand Board of Investment currently offers up to 8 years of corporate income tax exemption to businesses that focus on recycling/reuse of waste, recycled fiber production, or resource recovery from waste.^{cxv}

Calculated and Coordinated Fiscal Planning

To ensure the success of environmental taxation and other green fiscal measures, Thailand's environment, finance, and other relevant ministries (e.g. the Ministry of Public Health) should coordinate on the drafting, championing, and enactment of such policies. A major factor in determining the fate of green fiscal policies, particularly in Thailand, has been the country's system of governance, the degree of unity between government ministries, and the presence of political will. In 2010, a broad, sweeping Draft Framework Law on Economic Instruments for Environmental Management was proposed as a means to enact environmental taxation. However, this proposal was ultimately tabled due to the political climate and claims against the law's legality.^{cxvi}

Figure 8: Matrix of the short- and long-term impacts on the environment that the COVID-19 pandemic generated, from the perspective of stakeholders' importance in the Southeast Asia region.^{cxvii}



Stakeholders in Thailand and the rest of Southeast Asia view investment in renewable energy and public transportation as a low-importance priority with a long-term impact timeframe.^{cxviii} This is likely attributable to the fact that making these green investments is challenging during the COVID-induced economic recession.^{cxix} However, efforts should be made to change this mindset in Thailand and ensure that COVID policymaking aligns with the country's green economy goals.

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- i <https://www.imf.org/en/News/Articles/2021/06/21/na062121-5-things-to-know-about-thailands-economy-and-covid-19>
- ii <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7577870/>
- iii <https://ourworldindata.org/coronavirus/country/thailand>
- iv [Thailand situation report – 19 August 2021 \(WHO\)](#)
- v [SERC – Thailand \(UNDP\)](#)
- vi [Five Things to Know About Thailand’s Economy and COVID-19 \(IMF\)](#)
- vii [Thailand passes record Bt1.9-trillion stimulus package \(Thailand Business News\)](#)
- viii <https://www.imf.org/en/News/Articles/2021/06/21/na062121-5-things-to-know-about-thailands-economy-and-covid-19>
- ix [Thailand: 2021 Article IV Consultation-Press Release; Staff Report; and Statement by the Executive Director for Thailand \(IMF\)](#)
- x [Thailand increases debt plan for current fiscal year \(Reuters\)](#)
- xi [Thailand’s First Twin Deficit in Nearly a Decade to Hit Baht \(Yahoo Finance\)](#)
- xii [Thailand’s First Twin Deficit in Nearly a Decade to Hit Baht \(Yahoo Finance\)](#)
- xiii <https://link.springer.com/article/10.1007/s11356-020-11774-0#Tab1>
- xiv <https://www.channelnewsasia.com/news/asia/covid-19-thailand-bangkok-air-pollution-12674286>
- xv <https://www.th.undp.org/content/thailand/en/home/library/socio-economic-impact-assessment-of-covid-19-in-thailand.html>
- xvi <https://energyandcleanair.org/covid19-lockdowns-across-southeast-asia/>
- xvii <https://energyandcleanair.org/covid19-lockdowns-across-southeast-asia/>
- xviii <https://www.japantimes.co.jp/news/2020/05/12/asia-pacific/plastic-thailand-coronavirus-pollution/#.XtTfj54zZao>
- xix <https://www.channelnewsasia.com/asia/covid-19-thailand-bangkok-air-pollution-1338876>
- xx <https://link.springer.com/article/10.1007/s11356-020-11774-0#Tab1>
- xxi <https://www.channelnewsasia.com/news/asia/covid-19-thailand-bangkok-air-pollution-12674286>
- xxii <https://www.imf.org/en/News/Articles/2021/06/21/na062121-5-things-to-know-about-thailands-economy-and-covid-19>
- xxiii <https://www.th.undp.org/content/thailand/en/home/library/socio-economic-impact-assessment-of-covid-19-in-thailand.html>
- xxiv https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/documents/briefingnote/wcms_747944.pdf
- xxv <https://documents1.worldbank.org/curated/en/260291626180534793/pdf/Thailand-Economic-Monitor-The-Road-to-Recovery.pdf>
- xxvi <https://documents1.worldbank.org/curated/en/260291626180534793/pdf/Thailand-Economic-Monitor-The-Road-to-Recovery.pdf>
- xxvii https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/documents/briefingnote/wcms_747944.pdf
- xxviii <https://www.unicef.org/thailand/media/5666/file/Socio-Economic%20Impact%20Assessment%20of%20COVID-19%20in%20Thailand.pdf>
- xxix <https://documents1.worldbank.org/curated/en/260291626180534793/pdf/Thailand-Economic-Monitor-The-Road-to-Recovery.pdf>
- xxx https://www.nesdc.go.th/nesdb_en/download/article/PressSocial1-2564EN.pdf
- xxxi <https://www.th.undp.org/content/thailand/en/home/library/socio-economic-impact-assessment-of-covid-19-in-thailand.html>
- xxxii https://www.bot.or.th/Thai/SustainableBanking/Documents/Sustainable_Finance_Initiatives_for_Thailand.pdf
- xxxiii <https://www.th.undp.org/content/thailand/en/home/library/socio-economic-impact-assessment-of-covid-19-in-thailand.html>
- xxxiv <https://www.ghsindex.org/>
- xxxv <https://www.imf.org/en/News/Articles/2021/06/21/na062121-5-things-to-know-about-thailands-economy-and-covid-19>
- xxxvi <https://www.thaipbsworld.com/does-2022-budget-bill-answer-the-countrys-needs/>
- xxxvii https://sustainabledevelopment.un.org/content/documents/279482021_VNR_Report_Thailand.pdf
- xxxviii https://sustainabledevelopment.un.org/content/documents/279482021_VNR_Report_Thailand.pdf
- xxxix https://sustainabledevelopment.un.org/content/documents/279482021_VNR_Report_Thailand.pdf
- xl https://opsd.mod.go.th/Content/Speech_PM61/speech_en_610928.aspx
- xli <https://greenfiscalfpolicy.org/southeast-asia-could-lose-28-trillion-if-it-fails-to-act-fast-on-climate-change-report-finds/>
- xlii https://unfccc.int/sites/default/files/resource/BUR3_Thailand_251220%20.pdf
- xliii <https://www.climatewatchdata.org/data-explorer/historical-emissions>
- xliv It should be noted that, overall, Thailand’s GHG emissions represent less 1% of global emissions and lower than world average.
- xlv https://unfccc.int/sites/default/files/resource/BUR3_Thailand_251220%20.pdf
- xlvi https://unfccc.int/sites/default/files/resource/BUR3_Thailand_251220%20.pdf
- xlvii <https://news.un.org/en/story/2021/08/1096652>
-

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- xlvi <https://www.worldbank.org/en/news/press-release/2016/09/14/thailand-to-reduce-harmful-emissions-from-deforestation>
- xlix <https://www.cbd.int/countries/profile/?country=th>
- l <https://www.globalforestwatch.org/dashboards/country/THA>
- li <https://www.cbd.int/countries/profile/?country=th>
- lii <https://thailand.wcs.org/en-us/Initiatives/Wildlife-Crime-Investigation.aspx>
- liii <https://wedocs.unep.org/xmlui/bitstream/handle/20.500.11822/34948/MPN.pdf>
- liv <https://www.cbd.int/doc/nr/nr-06/th-nr-06-en.pdf>
- lv <https://www.cbd.int/countries/profile/?country=th>
- lvi <https://thethaiger.com/hot-news/environment/pm-pledges-to-protect-thailands-natural-resources-at-virtual-biodiversity-summit>
- lvii <https://www.nationthailand.com/noname/30390088>
- lviii <http://www.thaiembassyjakarta.com/en/thailand-activates-the-bcg-model-for-a-sustainable-recovery-from-covid-19/>
- lix https://sustainabledevelopment.un.org/content/documents/279482021_VNR_Report_Thailand.pdf
- lx <https://www.pdmo.go.th/pdmomedia/documents/2020/Jul/KOT%20Sustainable%20Financing%20Framework.pdf>
- lxi https://www.bot.or.th/English/AboutBOT/Activities/Pages/JointPress_18082021.aspx
- lxii https://www.bot.or.th/Thai/SustainableBanking/Documents/Sustainable_Finance_Initiatives_for_Thailand.pdf
- lxiii https://www.bot.or.th/Thai/AboutBOT/Activities/Documents/JointPressEN_18082021.pdf
- lxiv <https://wedocs.unep.org/bitstream/handle/20.500.11822/32923/BBB.pdf?sequence=1&isAllowed=y>
- lxv <https://greenfiscalpolicy.org/vietnam-blows-by-thailand-in-clean-energy-race/>
- lxvi https://www.jstor.org/stable/resrep26805?seq=11#metadata_info_tab_contents
- lxvii https://www.jstor.org/stable/resrep26805?seq=11#metadata_info_tab_contents
- lxviii https://thailand.prd.go.th/mobile_detail.php?cid=4&nid=10365
- lxix https://thailand.prd.go.th/mobile_detail.php?cid=4&nid=10677
- lxx <https://wedocs.unep.org/bitstream/handle/20.500.11822/35281/AWBBB.pdf>
- lxxi <https://www.imf.org/en/News/Articles/2021/06/21/na062121-5-things-to-know-about-thailands-economy-and-covid-19>
- lxxii <https://www.th.undp.org/content/thailand/en/home/library/socio-economic-impact-assessment-of-covid-19-in-thailand.html>
- lxxiii <https://thailand.un.org/en/50919-thailand-economic-focus-financial-stimulus-packages-combat-covid-19-and-achieve-sdgs>
- lxxiv <https://thailand.un.org/en/50919-thailand-economic-focus-financial-stimulus-packages-combat-covid-19-and-achieve-sdgs>
- lxxv https://www.unescap.org/sites/default/files/S2_Environmental-Tax-Reform.pdf
- lxxvi <https://www.undp.org/content/dam/thailand/docs/UNDP%20Thailand%20COVID-19%20Brochure.pdf>
- lxxvii https://read.oecd-ilibrary.org/view/?ref=136_136726-x5msnju6xg&title=Biodiversity-and-the-economic-response-to-COVID-19-Ensuring-a-green-and-resilient-recovery&_ga=2.166058430.1058075009.1631274459-600317674.1624460415
- lxxviii https://read.oecd-ilibrary.org/view/?ref=136_136726-x5msnju6xg&title=Biodiversity-and-the-economic-response-to-COVID-19-Ensuring-a-green-and-resilient-recovery&_ga=2.166058430.1058075009.1631274459-600317674.1624460415
- lxxix <https://greenfiscalpolicy.org/blog/investing-in-natural-capital-for-a-greener-and-fairer-recovery/>
- lxxx https://read.oecd-ilibrary.org/view/?ref=136_136726-x5msnju6xg&title=Biodiversity-and-the-economic-response-to-COVID-19-Ensuring-a-green-and-resilient-recovery&_ga=2.166058430.1058075009.1631274459-600317674.1624460415
- lxxxi <https://thethaiger.com/hot-news/tourism/tourism-jobs-continue-to-be-lost-nearly-1-million-in-2021>
- lxxxii <https://greenfiscalpolicy.org/blog/investing-in-natural-capital-for-a-greener-and-fairer-recovery/>
- lxxxiii FOOTNOTE – GRO AMOUNT
- lxxxiv https://www.iucn.org/sites/dev/files/import/downloads/phuket_sustainability_indicator_report_22_nov_2013.pdf
- lxxxv https://read.oecd-ilibrary.org/view/?ref=136_136726-x5msnju6xg&title=Biodiversity-and-the-economic-response-to-COVID-19-Ensuring-a-green-and-resilient-recovery&_ga=2.166058430.1058075009.1631274459-600317674.1624460415
- lxxxvi https://sustainabledevelopment.un.org/content/documents/279482021_VNR_Report_Thailand.pdf
- lxxxvii https://www.unescap.org/sites/default/files/S2_Environmental-Tax-Reform.pdf
- lxxxviii <https://greenfiscalpolicy.org/thailand-covid-19-delays-tax-reform-plans/>
- lxxxix <https://data.imf.org/?sk=77413F1D-1525-450A-A23A-47AEED40FE78>
- xc <https://greenfiscalpolicy.org/thailand-covid-19-delays-tax-reform-plans/>
- xc <https://stats.oecd.org/Index.aspx?DataSetCode=ERTR>
- xcii <https://www.th.undp.org/content/thailand/en/home/library/socio-economic-impact-assessment-of-covid-19-in-thailand.html>
- xciii https://unfccc.int/sites/default/files/resource/BUR3_Thailand_251220%20.pdf
- xciv https://thailand.prd.go.th/mobile_detail.php?cid=4&nid=10785
- xcv FAO UNDP UNEP (Forthcoming)
- xcvi https://unfccc.int/sites/default/files/resource/BUR3_Thailand_251220%20.pdf
-

-
- xcvii https://sustainabledevelopment.un.org/content/documents/279482021_VNR_Report_Thailand.pdf
- xcviii <https://greenfiscalpolicy.org/overfishing-update/>
- xcix <https://www.sciencedirect.com/science/article/pii/S0308597X19303677>
- c <https://www.unep.org/resources/report/measuring-fossil-fuel-subsidies-context-sustainable-development-goals>
- ci <https://www.imf.org/en/Topics/climate-change/energy-subsidies>
- cii <https://iclg.com/practice-areas/environment-and-climate-change-laws-and-regulations/thailand>
- ciii <https://www.iea.org/articles/putting-a-price-on-carbon-an-efficient-way-for-thailand-to-meet-its-bold-emission-target>
- civ Natural gas plants have a higher fuel price but a much lower emissions intensity.
- cv <https://www.iea.org/reports/the-potential-role-of-carbon-pricing-in-thailands-power-sector>
- cvi <https://www.greenpeace.org/static/planet4-thailand-stateless/2020/07/cf7b69a7-executive-summary-solar-rooftop-revolution-a-green-and-just-recovery-for-thailand-2021-2023.pdf>
- cvi <https://www.greenpeace.org/static/planet4-thailand-stateless/2020/07/cf7b69a7-executive-summary-solar-rooftop-revolution-a-green-and-just-recovery-for-thailand-2021-2023.pdf>
- cvi <https://www.greenpeace.org/static/planet4-thailand-stateless/2020/07/cf7b69a7-executive-summary-solar-rooftop-revolution-a-green-and-just-recovery-for-thailand-2021-2023.pdf>
- cix https://ec.europa.eu/environment/international_issues/pdf/File%20%20-%20G20%20Sustainable%20Finance%20for%20Circular%20Economy%20%28Tokyo%2010%20October%202019%29%20-%20Report.pdf
- cx http://www.boi.go.th/upload/content/TIR5_2019_5e2e95134a76b.pdf
- cxii https://www.unescap.org/sites/default/files/S2_Environmental-Tax-Reform.pdf
- cxii https://ec.europa.eu/environment/international_issues/pdf/File%20%20-%20G20%20Sustainable%20Finance%20for%20Circular%20Economy%20%28Tokyo%2010%20October%202019%29%20-%20Report.pdf
- cxiii <https://www.unepfi.org/publications/general-publications/financing-circularity/>
- cxiv <https://greenfiscalpolicy.org/blog/de-risking-circular-economy-investments-through-fiscal-policy-support/>
- cxv http://www.boi.go.th/upload/content/TIR5_2019_5e2e95134a76b.pdf
- cxvi https://www.unescap.org/sites/default/files/S2_Environmental-Tax-Reform.pdf
- cxvii <https://link.springer.com/article/10.1007/s11356-020-11774-0#Tab1>
- cxviii <https://link.springer.com/article/10.1007/s11356-020-11774-0#Tab1>
- cxix <https://www.sciencedirect.com/science/article/pii/S2542435120302737>

ANNEX VI

SCP-HAT country report Thailand

SCP-HAT country report Thailand

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This short report provides some high-level results from the Sustainable Consumption and Production Hotspots Analysis Tool (SCP-HAT) for Thailand. SCP-HAT is a tool to identify hotspot areas and priorities for policy efforts enabling sustainable consumption and production. The tool analyses a range of environmental pressures and impacts caused by domestic production. It also shows the environmental consequences of a country’s consumption occurring abroad. Results from SCP-HAT can be used to review national trends and to set national SCP priorities.

The tool has national level indicators for around 170 countries; it covers 26 economic sectors. The period covered by version 1 of SCP-HAT is 1990 to 2018. SCP-HAT is an analytical tool; its power lies in identifying sectors and environmental areas where critical action is needed to achieve sustainable development; it is not predictive, and it does not assess the effectiveness of sectoral policies, nor does it generate impact assessments of future policy action.

This country report has two parts. Part one is an overview of a country’s performance related to sustainable consumption and production (Country at a Glance). Results for the country are discussed in four main sections, reflecting key environmental categories: (1) **Primary material use**; (2) **GHG emissions and climate change**; (3) **Air pollution and health impacts**; and (4) **Land use**. A fifth section presents an overall **Sector** and sectoral specific data for: Agriculture, tourism (hotels and restaurants), energy and good. The text in boxes provides general explanations to facilitate understanding. Part two provides recommendations to address the specific environmental challenges and opportunities presented by each sector while promoting sustainability and economic growth in Thailand.

The period covered for Thailand is 1990 -2018.

Executive summary

Thailand is one of the foremost development success stories in Asia, with decades of sustained growth and impressive poverty reduction. Since the mid 1980’s average real per-capita incomes have tripled yet the Asian financial crisis in the late 1990’s and political instability in 2006 caused economic slowdown, severely affecting several sectors of the economy. Nevertheless, the country has

progressed well against the Millennium Development Goals and is a main driver of policy development for achieving the Sustainable Development Goals in the ASEAN region.

Growth in industrialization, urbanization and intensified agricultural production has relied extensively on the country's natural resources. For instance, forest cover fell dramatically, fish stocks have been reduced and the rapid expansion of industrialization and population growth hand in hand with rising living standards have ratcheted up material and energy demand, waste and GHG emissions.

Despite its status as an upper-middle income country and improvements on the human development index there are still unmet infrastructure needs in rural and urban areas, per-capital material use is low compared to high income countries signaling additional growth to come and a higher reliance of material and energy imports in the future. The fact that a lot of infrastructure still needs to be built in Thailand opens opportunities for resource efficiency, waste minimization and GHG reduction to be built into the future investment and development of Thailand.

Since the 9th National Economic and Social Development Plan (2002-2006) formulated the principle of the 'Sufficiency Economy Philosophy' consecutive plans have had an increasing focus on sustainable consumption and production aiming to conserve resources, improve resource efficiency, and to reduce waste and emissions while increasing living standards. The Twelfth National Economic and Social Development Plan (2017-2021) was presented during a period of increased global uncertainty and has focused on a development strategy characterized by moderation, reasonableness, and resilience. The 12th plan has formulated a strategy for environmentally friendly growth contribution to sustainable development.

The 12th plan has a focus, has set targets and presents indicators for the conservation of natural resources, building water security, reducing pollution, working towards GHG reduction including disaster risk mitigation. Because of the dual objectives of achieving economic growth and living standards while minimizing environmental pressures and impacts, and the policy challenges that poses, Thailand has focused on sustainable consumption and production to harmonize social, economic, and environmental outcomes.

The current version of SCP-HAT can support the development strategy in several ways and the historical data and trends as well as sectoral hotspots the toll presents can be used for setting priorities for Thailand. This is pertinent to resource conservation, GHG reduction, pollution control efforts of the country. In the next iteration SCP-Hat will also be able to inform water security in Thailand.

High-level results from SCP-HAT

From 1990 to 2018, **all relevant environmental pressures and impacts reported in SCP-HAT for Thailand increased significantly** against the backdrop of rapid socio-economic development and significant gains in living standards and poverty reduction. During most of the last 25 years Thailand had a balanced physical trade which is reflected in rather similar results for territorial and consumption-based pressures and impacts. For instance, Thailand's domestic material use, and material footprint are quite similar at 11.7 tonnes per capita and 11.9 tonnes per capita. Thailand has relied on imports of fossil fuels and metal ores and has supplied crops and timber to the world market. It is expected, however, that growing living standards and increased reliance on materials from abroad will result in material footprint growing faster compared to territorial material use.

The growth in all environmental pressures and impacts was by far surpassed by rapidly expanding economic activity and a commensurate high-growth rate in GDP allowing Thailand to achieve relative decoupling between GDP and environmental variables in all SCP-HAT reporting domains. This is mostly a result of structural change from high resource consuming activities in the primary and manufacturing

sectors to a larger share of urban service employment and added value that have a significantly lower material, energy, emission, and pollution intensity.

A sectoral analysis for Thailand shows that important environmental and health impacts, especially when looked at from a whole of supply chain perspective, i.e., their footprint, are relatively evenly distributed across many sectors. This requires strategies that are tailored to the specifics of the relevant sectors and technologies as well as an integrated economic and environmental policy approach that includes all relevant line agencies into one common strategy perhaps under the National Economic and Social Development Plan. The national planning commission could act as a head agency to coordinate the diverse line agencies to achieve a common outcome of reducing emissions and enabling significant improvements in resource efficiency and pollution reduction.

Most importantly, any national strategy will need to address the regional economic development issues that are prevalent in many parts of the country but especially in the Northeast. This integrated strategy needs to be aligned with a focus on developing secondary cities and a network of cities to counterbalance the Bangkok centered economic growth of the last few decades.

Thailand at a glance

1. Primary material use

Between 1990 to 2018, primary material use (i.e., domestic material extraction) in Thailand increased by 98.6%, from 393.8 million tonnes in 1990 to 781.9 million tonnes in 2018 (see Figure 1).

As part of a globalized economy, Thailand is relying on resource extraction from almost all countries of the world via imports of commodities and products. The sum of all these extractions caused by final consumption in Thailand is called “material footprint”¹. The material footprint of Thailand grew by 190.4% from 1990 to 2018 and reached 786 million tonnes in 2018. At the same time, GDP increased by 212.3%. As a result, material productivity², measured as GDP per material footprint, increased.

Comparison between the level of material footprint with economic growth (measured in GDP) and overall human development (measured as HDI) shows that Thailand

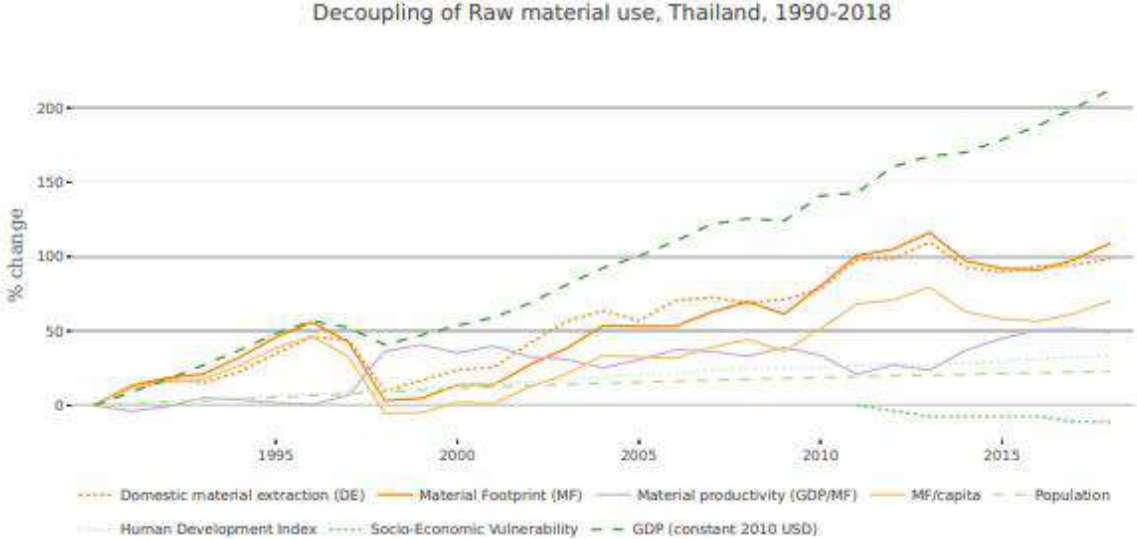
The extraction and use of primary materials fuels consumption and production activities in a country. With increasing material extraction, related environmental and social impacts are close to or already surpassing natural boundaries. Sustainable development goal (SDG) 8 (Decent work and economic growth) and 12 (Responsible consumption and production) as well as the concept of circular economy aim at increasing material efficiency, meaning using less raw materials per value added produced and increasing material productivity. To achieve sustainable raw material use, it is also essential to decouple³ a country’s economic growth from raw material consumption. This is accomplished if growth in GDP exceeds growth in supply chain wide material use (material footprint).

¹ The material footprint includes domestic and foreign extraction of materials needed along inter-/national supply chains to produce the final products consumed in a country. It equals domestic extraction plus imports minus exports translated into so-called Raw Material Equivalent (RME).

² Material productivity is the amount of economic output (measured as GDP) generated per unit of materials consumed (measured as material footprint). The indicator material productivity is used in many resources efficiency and circular economy policy frameworks aiming at reducing the environmental pressures and impacts associated with material use.

achieved relative decoupling³ (of its economic growth) from its material footprint between 1990 and 2018. In other words, GDP growth exceeded growth in material use across supply chains (material footprint).

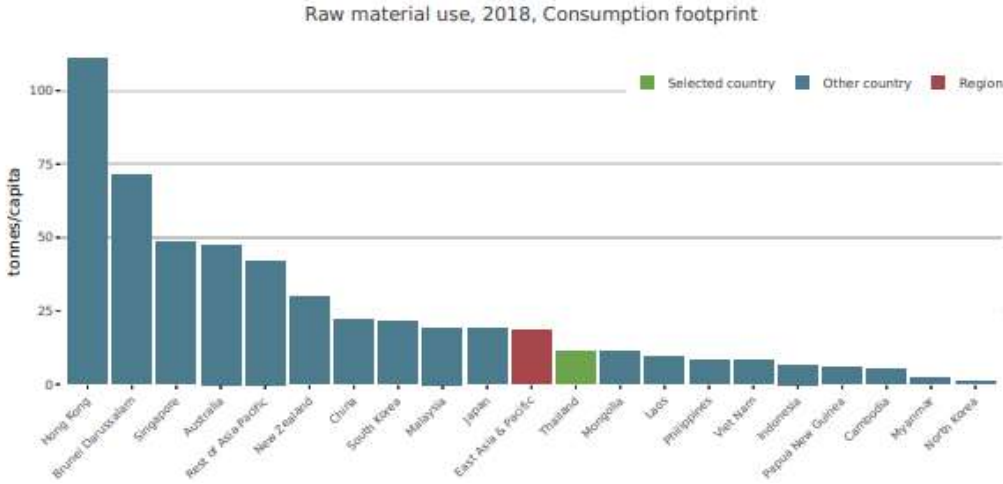
Figure 1



Source: UNEP (2022). Standard Report ‘Thailand at a Glance’ retrieved from the Sustainable Consumption and Production Hotspots Analysis Tool (SCP-HAT). UN Life Cycle Initiative, International Resource Panel, One Planet Network. Paris. Available at <http://scphat.lifecycleinitiative.org/countries-at-a-glance/>

At 11.3 tonnes per capita, primary material use in Thailand was somewhat lower compared to the regional (ASEAN) average of 18.2 tonnes per capita (see Figure 2). It is important to note that the average is driven by high consuming countries in the region including Australia, Brunei, and Mongolia.

Figure 2



³ When evaluating trends in decoupling environmental pressures and impacts from economic performance, two types of decoupling can be observed: 1) Relative decoupling is achieved when economic growth exceeds growth in environmental pressures and impacts or 2) absolute decoupling is observed where economic growth is achieved while simultaneously decreasing environmental pressures and impacts. While both cases involve increased efficiency, only the latter leads to a reduction of human pressures on the environment.

Source: UNEP (2022). Standard Report 'Thailand at a Glance' retrieved from the Sustainable Consumption and Production Hotspots Analysis Tool (SCP-HAT). UN Life Cycle Initiative, International Resource Panel, One Planet Network. Paris. Available at <http://scphat.lifecycleinitiative.org/countries-at-a-glance/>

2. GHG emissions and climate change

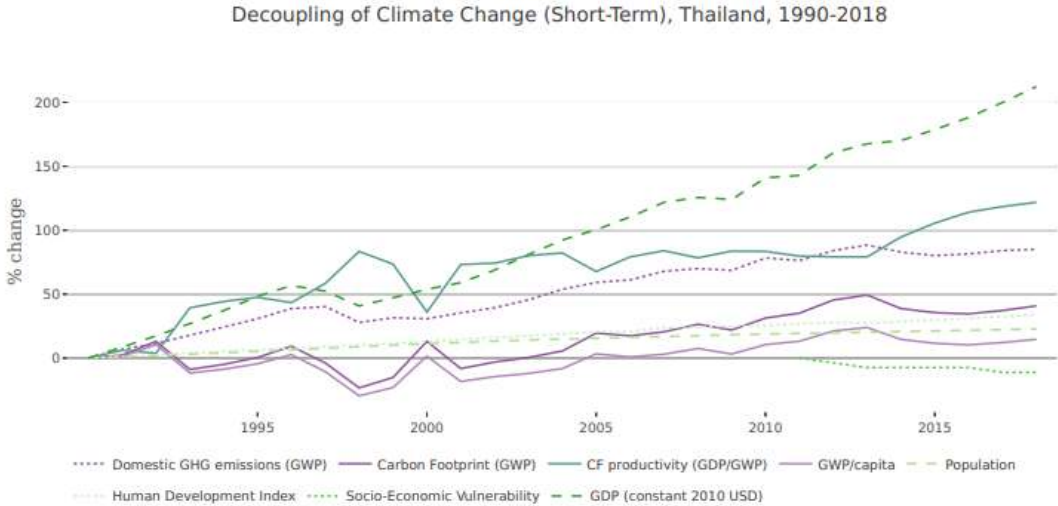
In the period 1990 to 2018, domestic GHG emissions and related impacts in Thailand increased by 85.1 % from 227.8 million tonnes CO₂ eq. in 1992 to 421.7 million tonnes CO₂ eq. in 2018 (Figure 3).

Via its international trade relations, Thailand is responsible for GHG emissions in almost all countries of the world. The sum of all these GHG emissions caused by final demand in Thailand is called "carbon footprint"⁴. The carbon footprint of Thailand decreased by 40.8 % from 1990 to 2018. It accounted for 373.7 million tonnes CO₂ eq. in 2018.

Comparing the levels of the supply chain wide GHG emissions (carbon footprint) with economic growth (measured in GDP) as well as with human development (measured as HDI), it can be seen that between 1990 and 2018, Thailand achieved relative decoupling³. This can be seen by the fact that GDP increased, while supply chain wide GHG emissions (carbon footprint) decreased.

To reduce societies' contribution to climate change, it is of utmost importance to reduce GHG emissions, while at the same time achieving socio-economic development as measured e.g., by GDP or the HDI. Apart from the emissions produced within a country (domestic GHG emissions), it is essential to account for all the GHG emissions produced along the supply chains of goods and services consumed in the country (this is known as the "carbon footprint"). The indicator "carbon productivity", measured as GDP per carbon footprint, can be used to track progress on a country's GHG emissions. Comparison between the development of GDP and carbon footprint will show if a country has achieved decoupling³ of economic growth from supply chain wide GHG emissions. Both domestic emissions and a country's carbon footprint can be "translated" into a parallel environmental impact –short-term (decades) or long-term (centuries) "global warming potential".

Figure 3

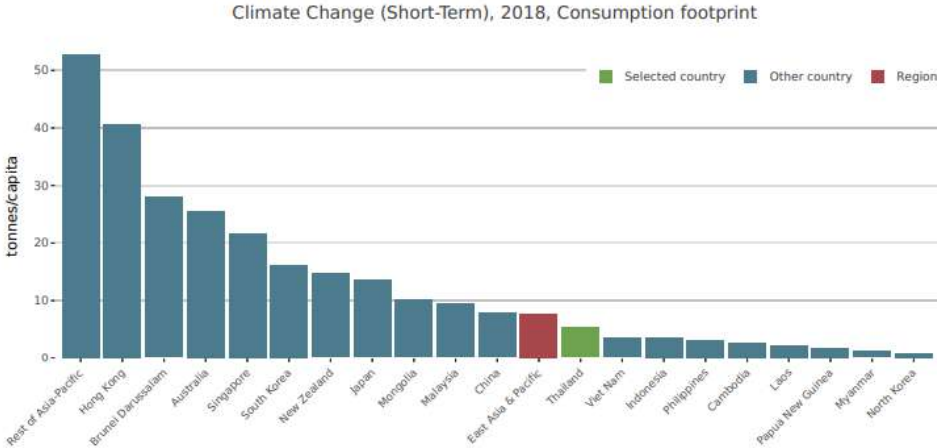


⁴ All goods imported into or exported by a country contain indirect GHG emissions that occurred along international supply chains. The carbon footprint of a country includes all domestic and foreign GHG emissions that occurred along the supply chains of the products consumed in a country.

Source: UNEP (2022). Standard Report 'Thailand at a Glance' retrieved from the Sustainable Consumption and Production Hotspots Analysis Tool (SCP-HAT). UN Life Cycle Initiative, International Resource Panel, One Planet Network. Paris. Available at <http://scphat.lifecycleinitiative.org/countries-at-a-glance/>

With 5.4 tonnes CO₂ eq. per capita (UNEP, 2022) the climate change impact caused by Thailand were about 29.3% per cent lower than the regional average (7.6 tonnes CO₂ eq. per capita in 2018) (Figure 4). In 2018, Thailand ranked nine among all countries of the Asia and Pacific region for its climate change impacts.

Figure 4



Source: UNEP (2022). Standard Report 'Thailand at a Glance' retrieved from the Sustainable Consumption and Production Hotspots Analysis Tool (SCP-HAT). UN Life Cycle Initiative, International Resource Panel, One Planet Network. Paris. Available at <http://scphat.lifecycleinitiative.org/countries-at-a-glance/>

3. Air pollution and health impacts

From 1990 to 2018, air pollution from domestic production in Thailand grew by 42.6 %, from 118.1 kilo-DALY in 1990 to 168.4 kilo-DALY in 2018 (Figure 1).

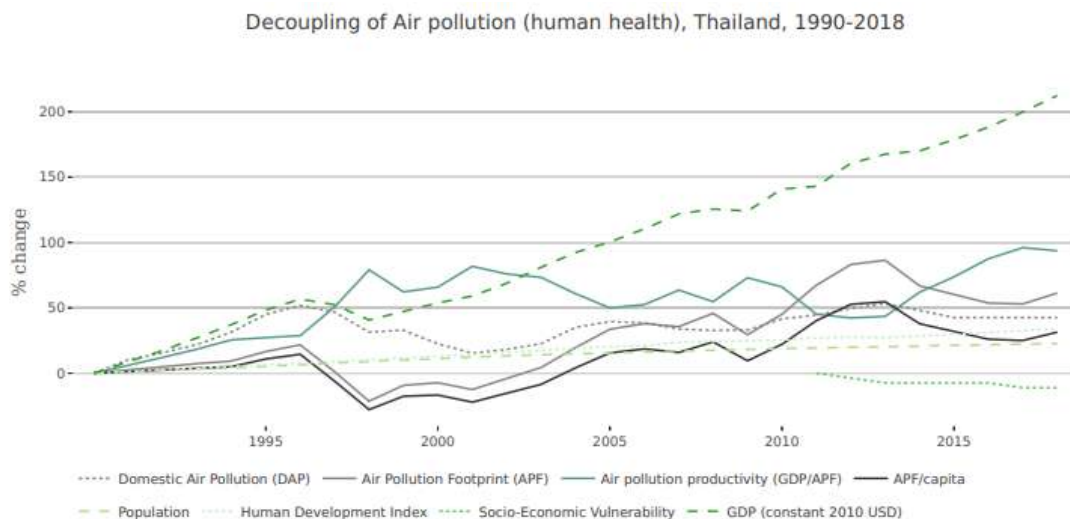
Thailand is responsible for air pollution impacts in almost all countries of the world via its international trade relations. The sum of all these air pollution impacts caused by domestic consumption in Thailand is called “air pollution footprint”⁵. The air pollution footprint of Thailand increased by 61.3 % in the same period. It accounted for 324.3 kilo-DALY in 2018.

During the same time, the GDP of Thailand increased by 61.3 %, meaning that air pollution productivity⁶ increased.

Comparison between levels of air pollution footprint with economic growth (measured in GDP) and human development (measured as HDI), shows that between 1990 and 2018, Thailand achieved relative decoupling³ (Growth in GDP and decrease of the air pollution footprint).

Air pollution is the biggest environmental health risk of our time, fundamentally altering our climate and creating profound impacts on the health of humans and that of the planet. Air pollution is a crosscutting topic and links to several SDGs, such as Goal 3 (Good health and well-being) and Goal 11 (Sustainable cities and communities). Tackling air pollution by setting emission targets and applying technical emission standards are ways to generate significant benefits for economies, human health, and the climate. The indicator DALY (disability-adjusted life years) reflects the years of healthy life lost due to premature mortality or due to disability. It is used to measure progress, the amount of air pollutants emitted, both domestically as well as along the supply chains of consumed goods. DALY Comparison between GDP and air pollution footprint indicates if a country has achieved decoupling³ of economic growth from air pollution.

Figure 5



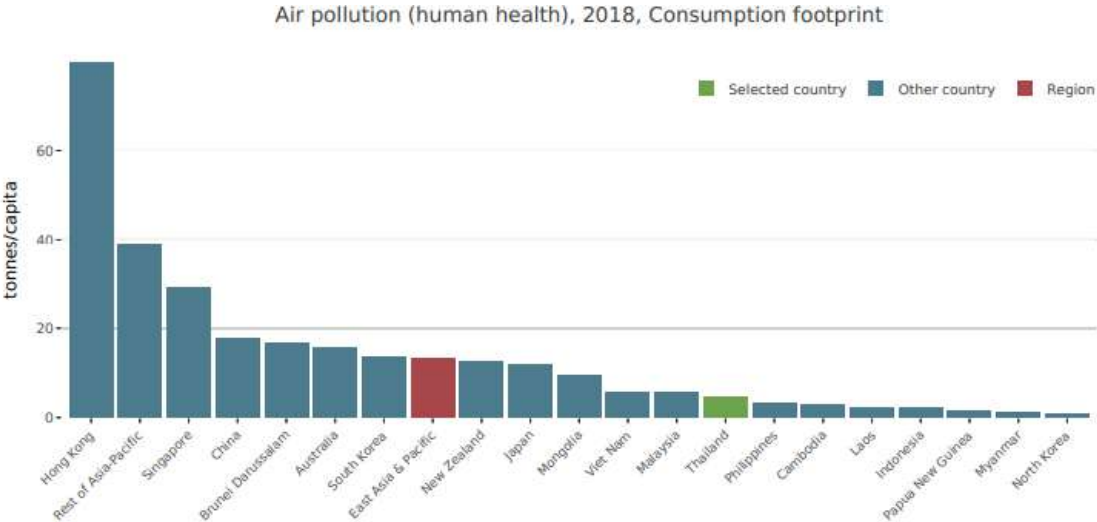
⁵ All goods imported into or exported by a country contain indirect air pollution impacts, that occurred along international supply chains. The air pollution footprint includes those air pollution impacts (domestic and foreign) that occurred along the supply chains to produce the final products consumed in a country.

⁶ Air pollution productivity is the amount of economic output (measured as GDP) generated per unit of air pollution produced across supply chains (air pollution footprint).

Source: UNEP (2022). Standard Report 'Thailand at a Glance' retrieved from the Sustainable Consumption and Production Hotspots Analysis Tool (SCP-HAT). UN Life Cycle Initiative, International Resource Panel, One Planet Network. Paris. Available at <http://scphat.lifecycleinitiative.org/countries-at-a-glance/>

Air pollution in Thailand (4.7 tonnes per capita) was around 64.5 % lower compared to the regional average (13.2 tonnes per capita). In 2018, Thailand ranked 8th among all countries of the region for air pollution (**Error! Reference source not found.**).

Figure 6



Source: UNEP (2022). Standard Report 'Thailand at a Glance' retrieved from the Sustainable Consumption and Production Hotspots Analysis Tool (SCP-HAT). UN Life Cycle Initiative, International Resource Panel, One Planet Network. Paris. Available at <http://scphat.lifecycleinitiative.org/countries-at-a-glance/>

4. Land use

Agricultural and forestry land grew by 12.1 % in Thailand between 1990 and 2018 (Figure 6). Intensively used land was at 26.4 million ha in 2018. The land footprint⁷ grew by 11.6 % over the same period and accounted for 26.8 million ha in 2018. At the same time, GDP increased by 212.3 %, meaning that “land productivity” in Thailand increased significantly.

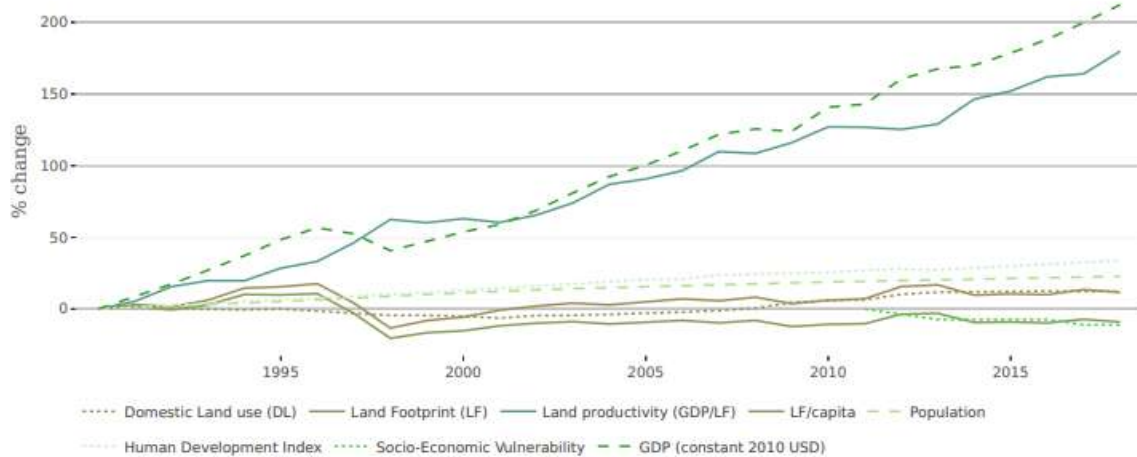
Between 1990 and 2018, Thailand achieved relative decoupling³ (Growth in GDP and decrease of the land footprint). This can be seen by comparing the land footprint with economic growth (measured in GDP) and with human development (measured as HDI).

Figure 6

Societies use land in a variety of ways, including for agricultural production, forestry, or urban and industrial areas. However, soil sealing, and intensive agriculture limit the capacity of land areas to function as part of the ecosystem, causing severe impacts such as biodiversity loss. SDG 15 (Life on land) focuses on the conservation and sustainable use of biodiversity and ecosystems as well as on sustainable land and forest management. This means reducing the demand for land for production to decrease pressure on and reduce competition of available land. The indicator PDF/year quantifies the environmental impact of land use on biodiversity as the potential loss of species brought about by a certain type of land use.

In addition to the land used within a country (in the graph referred to as “domestic production”), a country also relies on land areas in almost all countries of the world (via its international trade relation). The sum of land used domestically and abroad to produce goods for domestic consumption in a country is called “land footprint”.

Decoupling of Land use, Thailand, 1990-2018



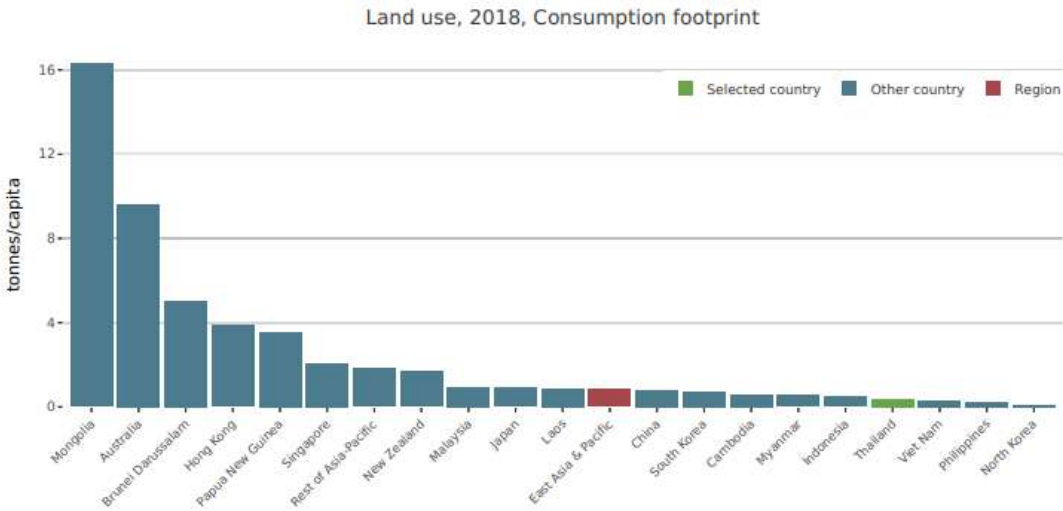
Source: UNEP (2022). Standard Report ‘Thailand at a Glance’ retrieved from the Sustainable Consumption and Production Hotspots Analysis Tool (SCP-HAT). UN Life Cycle Initiative, International Resource Panel, One Planet Network. Paris. Available at <http://scphat.lifecycleinitiative.org/countries-at-a-glance/>

Globalization and global supply chains result in an increasing spatial separation of environmental pressures and impacts associated with the production of traded commodities and their consumption. The comparison of the per-capita land footprint of Thailand (0.4 tonnes per capita) with other

⁷ All goods imported into or exported by a country contain indirect land use that occurred along international supply chains. The land footprint of a country includes the domestic and foreign land that was used along the supply chains of the products consumed in a country.

countries in the region shows that Thailand ranked 4., 54.3 % below the regional average of 0.8 tonnes per capita. (Figure 8).

Figure 7:



Source: UNEP (2022). Standard Report ‘Thailand at a Glance’ retrieved from the Sustainable Consumption and Production Hotspots Analysis Tool (SCP-HAT). UN Life Cycle Initiative, International Resource Panel, One Planet Network. Paris. Available at <http://scphat.lifecycleinitiative.org/countries-at-a-glance/>

5. Sector contribution

Figure 9:

illustrates the environmental and economic indicators for Thailand from a territorial or production perspective and consumption footprint. This information is important because it reveals national trends that can be directly influenced by domestic policy. Raw material use is concentrated to the two extractive sectors, agriculture (48.5 %) and mining and quarrying who provide materials form domestic sources and include crops, timber, and construction materials as well as smaller amounts of fossil fuels and metal ores. The environmental implications of agricultural and mining practices are governed by national and provincial rules and regulations.

SCP-HAT details 26 different sectors. The tool compares specific sectors’ contribution to a country’s territorial pressures and impacts (domestic production perspective). It also compares the environmental pressures and impacts caused along the sectors’ international supply chains (consumption perspective, footprint).

A large share of territorial GHG emissions, about one quarter, come from the power generation sector – electricity, gas, and water(22.8 %). Other large contributors are agriculture, the petroleum and minerals industry, the transport sector, and private households. Decarbonizing the electricity and transport sector will require large investment into distributed intermittent renewable energy generation, public transport and electromobility.

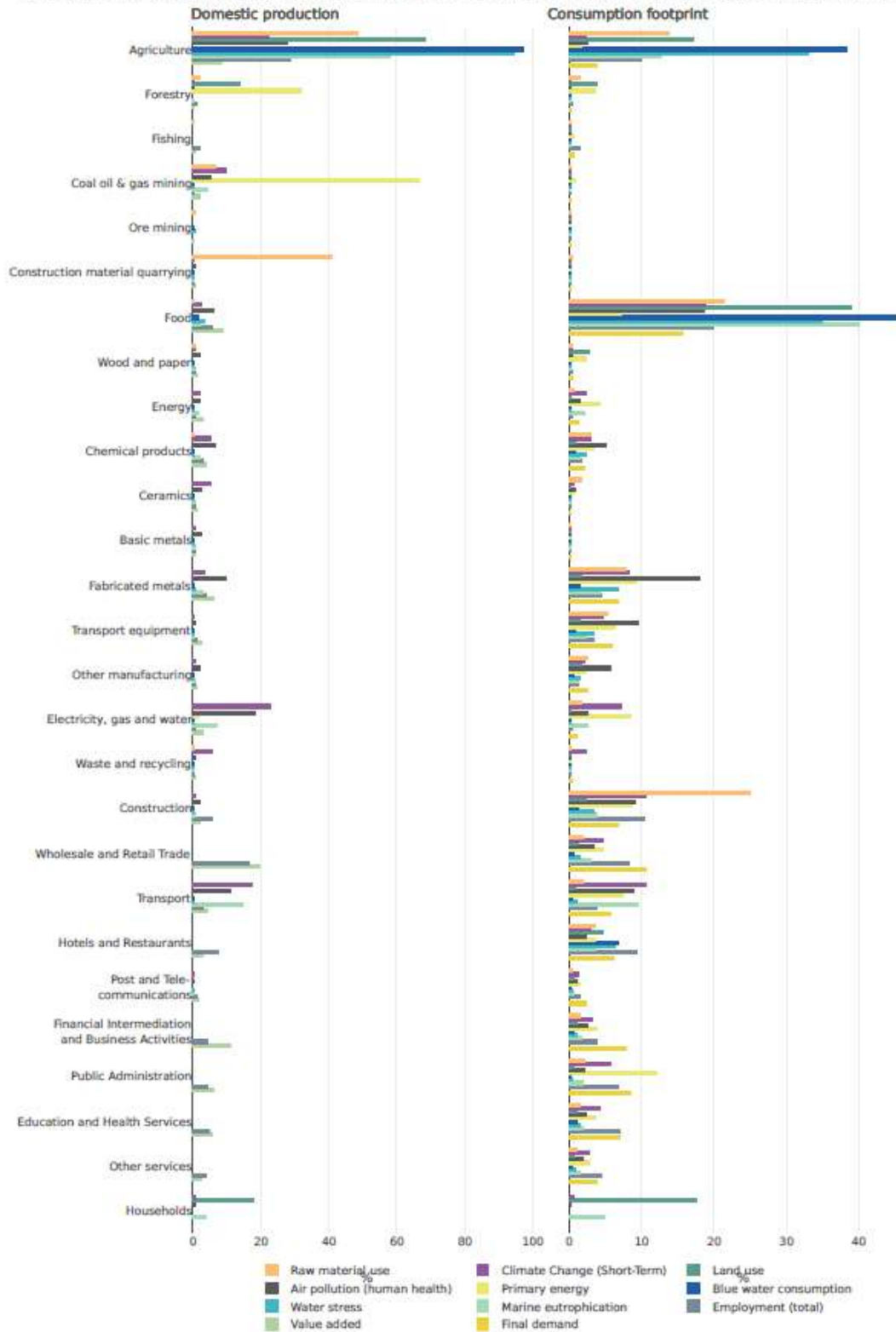
Air pollution and associated health impacts have a similar pattern to GHG emissions apart from the agricultural sector where the health impacts of air pollution are accumulating with a share of 40% of

all impacts because of the significant local pollution for smoke haze of charcoal and wood fires and agricultural burns.

In contrast, applying the consumption footprint perspective, the material footprint was dominated by products delivered to final demand by the sector Construction (24.9 %). With 19.0 %, the sector Food was hotspot sector regarding the carbon footprint, while the sector Food was the hotspot for the air pollution footprint (18.7 %), and Food for the land use footprint (38.9 %).

Figure 9:

Comparison of domestic production and consumption footprint by economic sector (% share in total), 2018



Source: UNEP (2022). Standard Report 'Thailand at a Glance' retrieved from the Sustainable Consumption and Production Hotspots Analysis Tool (SCP-HAT). UN Life Cycle Initiative, International Resource Panel, One Planet Network. Paris. Available at <http://scphat.lifecycleinitiative.org/countries-at-a-glance/>

6. Sector specific data

Agriculture sector⁸

In 2018 the sector Agriculture had the following shares in the overall domestic environmental pressures and impacts (ranks compare the sector with the other 26 aggregate sectors) in Thailand:

- raw material use: 48.5 %, rank 1.
- GHG emissions (i.e., climate change impacts): 22.4 %, rank 2.
- land use: 68.5 %, rank 1.
- air pollution: 27.9 %, rank 1.
- blue water consumption: 97.1 %, rank 1.
- water scarcity: 94.4 %, rank 1.
- energy production: 0.0 %, rank 27.
- marine eutrophication: 58.1 %, rank 1.

Comparing the environmental performance with socio-economic indicators, the sector Agriculture employed 28.7 % of the overall work force in Thailand. At the same time, the sector contributed 8.2 % to the overall monetary output produced in the economy of Thailand.

In 2018 the sector Agriculture had the following shares in the overall environmental pressures and impacts from the consumption footprint perspective (ranks compare the sector with the other 26 aggregate sectors) in Thailand:

- material footprint: 13.8 %, rank 3.
- carbon footprint: 2.4 %, rank 14.
- land footprint: 17.3 %, rank 3.
- air pollution footprint: 2.5 %, rank 10.
- blue water consumption footprint: 38.3 %, rank 2.
- water stress footprint: 33.0 %, rank 2.
- energy footprint: 1.7 %, rank 18.
- marine eutrophication footprint: 12.8 %, rank 2.

The labor footprint of a country accounts for the proportionate share of people working along the supply chains of the goods consumed in a country. In comparison to its share in the different environmental footprints of Thailand, the sector Agriculture contributed 10.0 % to the country's labor footprint. At the same time, the sector contributed 3.9 % to overall final demand in Thailand.

Tourism: Hotels and restaurants⁹

⁸ UNEP (2022): Standard Report 'Sector profile for Agriculture in Thailand' retrieved from the Sustainable Consumption and Production Hotspots Analysis Tool (SCP-HAT). UN Life Cycle Initiative, International Resource Panel, One Planet Network. Paris. Available at scphat.lifecycleinitiative.org/sector-profiles/

⁹ UNEP (2022): Standard Report 'Sector profile for Agriculture in Thailand' retrieved from the Sustainable Consumption and Production Hotspots Analysis Tool (SCP-HAT). UN Life Cycle Initiative, International Resource Panel, One Planet Network. Paris. Available at scphat.lifecycleinitiative.org/sector-profiles/

In 2018 the sector Hotels and Restaurants had the following shares in the overall domestic environmental pressures and impacts (ranks compare the sector with the other 26 aggregate sectors) in Thailand:

- raw material use: 0.0 %, rank 27.
- GHG emissions (i.e., climate change impacts): 0.0 %, rank 27.
- land use: 0.0 %, rank 27.
- air pollution: 0.0 %, rank 27.
- blue water consumption: 0.0 %, rank 27.
- water scarcity: 0.0 %, rank 27.
- energy production: 0.0 %, rank 27.
- marine eutrophication: 0.0 %, rank 27.

Comparing the environmental performance with socio-economic indicators, the sector Hotels and Restaurants employed 7.5 % of the overall work force in Thailand. At the same time, the sector contributed 2.9 % to the overall monetary output produced in the economy of Thailand.

In 2018 the sector Hotels and Restaurants had the following shares in the overall environmental pressures and impacts from the consumption footprint perspective (ranks compare the sector with the other 26 aggregate sectors) in Thailand:

- material footprint: 3.6 %, rank 6.
- carbon footprint: 3.0 %, rank 11.
- land footprint: 4.7 %, rank 4.
- air pollution footprint: 2.4 %, rank 13.
- blue water consumption footprint: 6.9 %, rank 3.
- water stress footprint: 6.5 %, rank 4.
- energy footprint: 3.6 %, rank 11.
- marine eutrophication footprint: 3.6 %, rank 7.

In comparison to its share in the different environmental footprints of Thailand, the sector Hotels and Restaurants contributed 9.3 % to the country's labor footprint. At the same time, the sector contributed 6.1 % to overall final demand in Thailand.

Energy¹⁰

In 2018 the sector Energy had the following shares in the overall domestic environmental pressures and impacts (ranks compare the sector with the other 26 sectors) in Thailand:

- raw material use: 0 %, rank 27.
- GHG emissions (i.e., climate change impacts): 2 %, rank 10.
- land use: 0 %, rank 27.
- air pollution: 2 %, rank 13.
- blue water consumption: 0 %, rank 14.

¹⁰ UNEP (2022): Standard Report 'Sector profile for Agriculture in Thailand' retrieved from the Sustainable Consumption and Production Hotspots Analysis Tool (SCP-HAT). UN Life Cycle Initiative, International Resource Panel, One Planet Network. Paris. Available at scphat.lifecycleinitiative.org/sector-profiles/

- water scarcity: 0 %, rank 14.
- energy production: 0 %, rank 27.
- marine eutrophication: 2 %, rank 9.

Comparing the environmental performance with socio-economic indicators, the sector Energy employed 0 % of the overall work force in Thailand. At the same time, the sector contributed 3 % to the overall monetary output produced in the economy of Thailand.

In 2018 the sector Energy had the following shares in the overall environmental pressures and impacts from the consumption footprint perspective (ranks compare the sector with the other 26 sectors) in Thailand:

- material footprint: 1 %, rank 18.
- carbon footprint: 2 %, rank 15.
- land footprint: 0 %, rank 19.
- air pollution footprint: 2 %, rank 16.
- blue water consumption footprint: 0 %, rank 17.
- water stress footprint: 0 %, rank 17.
- energy footprint: 4 %, rank 9.
- marine eutrophication footprint: 2 %, rank 11.

In comparison to its share in the different environmental footprints of Thailand, the sector Energy contributed 0 % to the country's labor footprint. At the same time, the sector contributed 1 % to overall final demand in Thailand.

Food¹¹

In 2018 the sector Food had the following shares in the overall domestic environmental pressures and impacts (ranks compare the sector with the other 26 sectors) in Thailand:

- raw material use: 0 %, rank 8.
- GHG emissions (i.e., climate change impacts): 2 %, rank 9.
- land use: 0 %, rank 27.
- air pollution: 6 %, rank 6.
- blue water consumption: 2 %, rank 2.
- water scarcity: 3 %, rank 2.
- energy production: 0 %, rank 27.
- marine eutrophication: 2 %, rank 7.

Comparing the environmental performance with socio-economic indicators, the sector Food employed 6 % of the overall work force in Thailand. At the same time, the sector contributed 9 % to the overall monetary output produced in the economy of Thailand.

¹¹ UNEP (2022): Standard Report 'Sector profile for Agriculture in Thailand' retrieved from the Sustainable Consumption and Production Hotspots Analysis Tool (SCP-HAT). UN Life Cycle Initiative, International Resource Panel, One Planet Network. Paris. Available at scphat.lifecycleinitiative.org/sector-profiles/

In 2018 the sector Food had the following shares in the overall environmental pressures and impacts from the consumption footprint perspective (ranks compare the sector with the other 26 sectors) in Thailand:

- material footprint: 21 %, rank 2.
- carbon footprint: 19 %, rank 1.
- land footprint: 39 %, rank 1.
- air pollution footprint: 19 %, rank 1.
- blue water consumption footprint: 46 %, rank 1.
- water stress footprint: 35 %, rank 1.
- energy footprint: 7 %, rank 6.
- marine eutrophication footprint: 40 %, rank 1.

In comparison to its share in the different environmental footprints of Thailand, the sector Food contributed 20 % to the country's labor footprint. At the same time, the sector contributed 16 % to overall final demand in Thailand.

7. Conclusions and policy recommendations

Comparing different sectors' contribution to national environmental pressures and impacts (domestic production perspective) with their contributions to the environmental footprints of Thailand (consumption footprint perspective), service sectors are usually found to contribute more to the footprint than to the environmental pressures and impacts caused by their domestic production activities. This can be explained by the low environmental intensity of their activities, but at the same time, environmentally intensive supply chains and a large contribution to final demand.

Based on the data and analysis presented, here are some policy recommendations for Thailand to address environmental pressures and impacts, particularly focusing on sectors with significant contributions. These policy recommendations aim to balance economic growth with environmental sustainability and address the specific challenges presented by different sectors in Thailand. Implementing a combination of these policies can help reduce the country's environmental footprint while supporting its economic development goals:

- **Promote Sustainable Agriculture Practices:**

Agriculture and food and beverages also have a very large contribution to land use footprint at 42.7% of overall and once hotels and restaurants are added contribute half of all land use pressure across supply chains. While agriculture and the food system need to be a focus for achieving the nutrition related objectives of the SDG's they also deserve attention for environmental reasons to design a food system that reduces negative environmental impacts and delivers the needed quantity and quality of food.

Given the substantial environmental impacts of the agriculture sector, particularly in terms of land use and air pollution, the government should prioritize policies that promote sustainable farming practices, reduced pesticide use, and better waste management in agriculture. Given the high land use footprint, Thailand should focus on land-use planning to prevent excessive conversion of natural habitats and

forests into agricultural land. Encourage sustainable land use practices that prioritize conservation. Acknowledging the sector's employment contribution, it would be important to provide training and support to transition workers to more sustainable practices, such as organic farming or agroforestry.

- **Energy Transition and Decarbonization:**

Recognizing the high contribution of the power generation sector to GHG emissions, Thailand should invest in transitioning its energy production towards distributed intermittent renewable energy sources. This could include incentives for renewable energy production and energy efficiency measures.

- **Promote Sustainable Tourism:**

While the Hotels and Restaurants sector has a relatively low environmental footprint from domestic production, it contributes significantly to the consumption footprint. To balance economic growth with environmental sustainability, policies should encourage sustainable tourism practices, energy efficiency in hotels, and sustainable food sourcing in restaurants.

- **Incentivize Sustainable Construction:**

Since the construction sector dominates material extraction and contributes significantly to land use, policies should promote sustainable construction practices, including the use of recycled materials, efficient land use, and environmentally friendly building techniques.

- **Reduce Food System Environmental Impact:**

Given the high material footprint, carbon footprint, and land use footprint of the food and beverage sector, Thailand should promote sustainable food production and consumption. This could involve supporting organic farming, reducing food waste, and promoting sustainable diets.

Promote circular economy principles in the food sector, including recycling food waste, reducing single-use packaging, and encouraging food producers to adopt eco-friendly practices.

- **Integrated Supply Chain Management for GHG Emissions:**

Due to the distributed nature of sectors contributing to GHG emissions through supply chains, Thailand should develop an integrated strategy involving various government agencies to manage emissions effectively. This could include setting emission reduction targets, incentivizing cleaner technologies, and regulating emissions across supply chains.

Foster collaboration between different sectors to find innovative solutions that address multiple environmental challenges simultaneously. Cross-sectoral coordination can lead to more effective policies and practices. A

- **Promote Circular Economy Practices:**

To address material and land use footprints, Thailand should promote circular economy practices, encouraging recycling, reusing, and reducing material waste throughout the production and consumption process.

- **Consumer Education and Awareness:**

Educate consumers about the environmental impact of their consumption choices and encourage sustainable behavior through awareness campaigns. Informed consumers can drive demand for more sustainable products and services.

- **Incentives and Regulations:**

Develop a mix of incentives and regulations to encourage businesses to adopt sustainable practices. This may include tax incentives for green investments, carbon pricing, and stricter environmental regulations.

Sectors that have a large economic contribution and a small relative environmental pressure and impact like hotel and restaurant, wholesale and retail trade, could be the target for incentive setting and policy reform.



PAGE PARTNERSHIP FOR ACTION ON GREEN ECONOMY

This report evaluated the impacts of the Thai Government Economic and Social Rehabilitation Fund Package on Sustainable Development Goals (SDGs), Nationally Determined Contributions (NDCs), and other global sustainability frameworks. The study's objective is to conduct an in-depth assessment of the six selected projects funded under the 400-billion Baht Rehabilitation Fund of the Royal Thai Government from a green perspective to advance the green economy agenda in national economic recovery policy formulation.

The six selected projects are as follows:

- 1) One Tambon One New Theory Agriculture Group,
- 2) Kok Nong Na (Land-Water-Rice Field) Model,
- 3) Development of Pilot Areas for Travel Safety Zones,
- 4) Upgrading the Economy in the Central-Western Economic Corridor using the BCG (Bio-Circular-Green) model,
- 5) Cotton Valley Creation, and
- 6) Processing of Dried Banana using Solar Energy in Pang-Nga Province.

Based on the findings of this analysis, policy guidance was developed to assist the government in developing SDG- and NDC-aligned policies and recovery packages.

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