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SOCIAL RETURN ON INVESTMENT OF THE BIODIVERSITY OFFSET ACTION PLAN OF KHUNG BANGKACHAO, THAILAND

Kanlaya NAKLUNGKA¹, Srinath CAICHOMPOONOPPAKUL², Suwanna TEERSUWAN³,
Chairut BOONNAK³ and Sarawut NAPATALUNG⁴

1 Faculty of Management Science, Phranakhon Rajabhat University, Thailand;
kanlaya@pnru.ac.th

2 Independent Scholar, Thailand; s.nath2499@gmail.com

3 Biodiversity-based Economy Development Office, Thailand; suwanna@bedo.or.th
(S. T.); chairut@bedo.or.th (C. B.)

4 Faculty of Humanities and Social Sciences, Phranakhon Rajabhat University,
Thailand; sarawut.n@pnru.ac.th

Handling Editor:

Professor Dr.Muhlis MADANI

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Abstract

The objectives of the research were 1) to study the biodiversity offset activities in the area: Khung Bangkachao 2) to analyze social returns on investment (SROI) of the biodiversity offset action plan. The qualitative, quantitative, and participatory action research methods were employed in this study. By studying document, focus group, study the cost and return data of 31 model farmers. Then, the value was converted into monetary value. The results of this study showed that the biodiversity offset activities, in the case of increasing green area by 10% within the 5-year project duration, the 3 supporting activities with potentials for investment had been selected as follows: 1) financial support for natural resource conservation and restoration, 2) fertilizer support, and 3) solar water system support. It was found that the present value of the investment is 8,500,159 Baht and the present value of return is 12,848,744 Baht. SROI value was 1.51 times. The study showed that the economic returns came from the sales of agriculture products, reducing fertilizer costs, decreasing the electricity costs by solar water system; the social returns caused the employments in the area; and the environmental returns came from the value of perennial plants, ecosystem service value, and reducing the environmental costs of using the solar cells. The private sector can initially support fertilizers or solar water system. Government agencies can use it as an incentive for conservation among stakeholders.

Keywords: Biodiversity Offset, Social Return on Investment, Khung Bangkachao Area

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Introduction

Biodiversity can support and strengthen an ecosystem necessary to human livelihood. It is a basis of economic and social development and environment stability. On the other side, it has been threatened continuously from exploitation regardless of recovery limitation and capacity, contributing to severe effects (Office of Natural Resources and Environmental Policy and Planning, 2015; for example, animal habitat destruction that shall increase a risk of exposure to diseases between humans and wild animals which can be seen from the Covid-19 pandemic. Therefore, biodiversity conservation is given importance all over the world (United Nations, 2020).

Biodiversity-based Economy Development Office (BEDO), a government organization that aims to develop economy from biodiversity as a mechanism for conservation and utilization biodiversity in a sustainable manner, has studied operational guidelines to propel the conservation and restoration biodiversity in Khung Bangkachao, Phra Pradaeng district, Samut Prakan province, a large green area near Bangkok that contains uniqueness characterized as a wetland ecosystem. According to the cabinet resolution on 14 September 1977, Khung Bangkachao was designated as a conserved green area and it has been named as The Best Urban Oasis (Marshall, 2006). The green area of Khung Bangkachao consists of community forest supervised by a government agency and people's agricultural areas that have been inherited for such a long time. Forest and plants help filter and clean the air. It is a source to produce purified air to Bangkok and neighboring areas. Meanwhile, Kung Bangkachao is rich in biodiversity as it is found that there are 305 species of animals and 371 species of plants (Caichompoo & Caichompoo, 2015). In Khung Bangkachao, there is a geographical indication certified mango, namely, Nam Dok Mai Khung Bangkachao, applied for registering geographical indication by 1) Khung Bangkachao Nam Dok Mai Mango Community Enterprise, 2) Biodiversity-based Economy Development Office, 3) Phranakhon Rajabhat University (Department of Intellectual Property, 2014).

Today, a lot of farmers in Khung Bangkachao make a living by agriculture since they would like to carry on their agricultural profession and conserve the green area, a place where they take pride in beyond a source of income. However, due to the current economic and social situation, farmers need to confront risks in production and marketing, such as higher costs of production, yield declines, decrease in product prices, narrow channels of distribution, leading to job abandonment. If this situation remains, it shall affect biodiversity sustainability (Naklungka et al., 2021). As a consequence, Biodiversity-based Economy Development Office studied operational guidelines to propel the conservation and restoration of biodiversity in Thailand by using an economic tool like biodiversity offset, and Khung Bangkachao is the pilot area. The findings from the study revealed that an operating mechanism suitable for Thailand should start from evaluating biodiversity values of agricultural plots that seem to have potential and studying compensation models/activities that are suitable. It was found that the first two activities, the farmers would like to participate in the implementation were 1) the support of factors of production in agricultural sector (such as water/fertilizer/production factors), 2) financial support for the conservation and restoration of natural resources in agricultural areas (Naklungka et al., 2021).

This research article aims to study a model of biodiversity compensation activities suitable for Khung Bangkachao area. Biodiversity compensation activity plans were prepared with the cooperation of farmers, private agency, and government agency working in the area, and evaluate social return on investment (SROI) of the activity plans in order to learn about economic cost benefit showing worthiness of investment in terms of economy, society, and environment, leading to discussing together with relevant agencies that shall provide support accordingly.

Literature Review

Biodiversity Offset

Business and Biodiversity Offsets Programme (2012) defines biodiversity offset as measurable conservation outcomes of actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken. Kate et al. (2004) defines biodiversity offset as conservation activities intended to compensate for the residual, unavoidable harm to biodiversity caused by development project, and Darbi (2010) mentioned biodiversity offset as conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development and persisting after appropriate prevention and mitigation measures have been implemented. It can be said that biodiversity offset is a tool for biodiversity conservation that aims to compensate for the residual, unavoidable harm to biodiversity caused by development project in an area by supporting activities in various models in that area or other areas in order to generate positive impacts equal to or more than the loss incurred.

Social Return on Investment (SROI)

The principles of The SROI Network (2012) and Thai Health Promotion Foundation (2014) are applied which can be divided into 5 steps as 1) stakeholder scope and analysis. 2) outcome mapping, the process showing the connection according to the conceptual framework of the analysis, i.e., input, production process, and output arising in the project. 3) outcome data collection and financial value evaluation by developing indicators being able to measure designated outcomes to be used in analyzing return on investment. Financial proxy or an estimate is calculated to replace the financial value of the outcomes. The outcomes are divided into 3 aspects as economic outcome, social outcome, and environmental outcome. 4) setting and gathering information related to impacts that may or may not arise from a project. And 5) calculation of SROI, outcome report and utilization of SROI as the present value of all social benefits per an investment unit. If SROI is greater than 1, it is worth implementing activities. The formula used to calculate SROI is as follow:

$$\text{SROI} = \frac{\text{Present value of all outcomes}}{\text{Present value of all investments}}$$

Research Methodology

The study was conducted on the basis of mixed method research design that combines 1) qualitative method using documentary research, focus group discussion, and participatory action research to collect data before transforming into financial value, and 2) quantitative method is used to transform social value or outcomes of social transformation into financial value (financial proxy) through cost-benefit analysis.

Population and Sample

31 pilot farmers from the project of bio-offset principal expansion in Khung Bangkachao (Naklungka et al., 2021) and key informants selected by purposive sampling method, i.e., 2 representatives from Khung Bangkachao Nam Dok Mai Mango Community Enterprise, 2 representatives from Phra Pradaeng District Agricultural Extension Office, 2 representatives from Khung Bangkachao Sub-district Administrative Office, 2 representatives from private companies, and 2 academics.

Data Collection

SROI evaluation form consists of stakeholder scope and analysis, outcome mapping, outcome inspection and financial value evaluation, impact identification, and SROI calculation. The evaluation form is submitted to 3 experts for examining appropriateness and accuracy.

Primary data were collected from key informants, namely, pilot farmers from the project of bio-offset principal expansion in Khung Bangkachao 2021, representatives from Phra Pradaeng District Agricultural Extension Office, representatives from Khung Bangkachao Sub-district Administrative Office, representatives from private companies, and academics. A focus group meeting was held for brainstorming. Secondary data were obtained from the study on costs of production, income of pilot farmers from the project of bio-offset principal expansion in Khung Bangkachao 2021, and additional data, i.e., academic articles, theses, relevant research studies, and relevant information on the internet.

Data Analysis

The data collected evaluated social return on investment. The framework of biodiversity offset activity scheme is the support to increase the number and quality of green spaces by growing perennial plants or fruit trees 10% or 250 trees per year (calculated from the number of perennial plants and fruit trees of all 31 pilot farmers, 2,500 trees in total). The duration of the project is 5 years. Three feasible activities that produce tangible outcomes were selected, i.e., 1) financial support in the conservation and restoration of natural resources, 2) the support of factors of production, such as fertilizer, and 3) the support of solar water supply system.

Research Results

SROI evaluation started from the evaluation of investment value of the activity scheme and the evaluation of economic, social, and environmental returns as follows:

Evaluation of Investment Value

The values of all costs obtained from the interview with the 31 pilot farmers are used as the initial investment in the 1st year. Consideration of feasibility in receiving the support or the implementation of biodiversity offset activities found that there were 3 supporting activities agreed by farmers, agencies in the area and private sector, i.e., labor cost of owner's equity, fertilizer cost, and electricity cost. Models of the support are as follows:

Activity 1 - Financial support for the conservation and restoration of natural resources was accounted for 267,840 baht per year, 1,133,388 baht in total, calculated from the labor cost of owner's equity. Therefore, this part is considered the support or offset of the labor cost of owner's equity.

Activity 2 - Support of production factors, i.e., fertilizer. In this regard, it was the support of organic fertilizer and bio-fertilizer, accounted for 186,000 baht per year, 930,000 baht in total, calculated from farmers' costs of fertilizer. Therefore, this part is considered the support or offset of farmers' costs of fertilizer.

Activity 3 - Support of solar water supply system accounted for 620,000 baht. This is a one-time investment calculated from the investment in solar water supply system per set, 20,000 baht, 31 sets in total. This part is considered the support or offset of farmers' electricity cost. This study gathered all costs of other overheads (labor, plant varieties, pesticides, cost of water, cost of electricity, cost of transport, depreciation, etc.) in the same category. The value in the 1st year was 1,141,803 baht, in the 2nd year was 1,187,474 baht, in the 3rd year was 1,234,975 baht, in the 4th year was 1,284,372 baht, and in the 5th year was 1,335,749 baht, based on the inflation rate at 4% per year (Office of the National Economic and Social Development Council, 2022). The sum total of all investments was 8,867,760 baht. It can be evaluated to the present value equal to 8,500,159 baht, based on the rates of 5-year government bond returns, 1.471 baht (Bank of Thailand, 2022).

Evaluating Return on Investment

Step 1 - Identify key stakeholders: It consists of 4 groups of people, i.e., 1) the group of 31 pilot farmers from the project of bio offset principal expansion in Khung Bangkachao, 2) community leaders, organizations and agencies in the area, 3) private agencies providing support, and 4) Biodiversity-based Economy Development Office.

Step 2 - Mapping outcomes: It consists of a meeting of a group of stakeholders for brainstorming and seeking outcomes by changing input through activities to output showing any outcome/impact from the operations.

Step 3 - Evidencing outcomes and then availability:

Economic outcome - Indicator 1 - revenue generated from selling fruits and vegetables by calculating the value that increases by 10% per year. Indicator 2 - revenue generated from selling flowering and ornamental plants. Indicator 3 - revenue from selling grafts of mango varieties. Indicator 4 - fertilizer cost reduction; the value being the discount of fertilizer cost. Indicator 5 - reduction of electricity cost from solar water pump system, roughly calculated electricity generated from 10kW solar system, 59,400 baht per year (Dprompt Solar Cell, 2021). In this case, it is estimated that the production capacity is 21.7 kW (700 Watts per system, 31 systems in total).

Social outcome - Employment takes place in the area. The indicator is the value generated from greater employment (from financial support of agencies, considered the offset of garden care in owner's equity).

Environmental outcome - More green spaces are provided, generating the value of ecosystem services while the environment is getting better. Indicators selected and evaluation of values are as follows: Indicator 1: The value of perennial plants from a higher planting plan by 10% accounted for 250 trees per year. The value of perennial plant is 100 baht per tree. Indicator 2: The value of ecosystem services. It is estimated that the number of visitors will be increased by 10% per year, calculated from willingness to spend on the restoration of the ecosystem and biodiversity in Khung Bangkachao (Phetcharut, 2016) at 1,474 baht per person per year. According to the in-depth interview, in the previous year there were 3,600 people who visited and learned in farmers' agricultural plots. If people willing to spend on the restoration accounted for 20.50%, that would be 738 people. Indicator 3: Reduction of environmental cost from using solar system, calculated from 1kW solar system production capacity that shall reduce greenhouse gas emission by 1.3456 tons. Under the circumstances, total production capacity would be 21.7 kW and 21.20 tons of greenhouse gas emission can be reduced. The price for carbon credit trading as of 30 August 2022 (Thailand Greenhouse Gas Management Organization, 2022) was 877.50 baht per ton.

Step 4 - Establishing impact: Components considered are 1) deadweight is an existing consequence though the project does not carry out any activity. 2) Attribution is the proportion of an outcome resulted from the project operations and other stakeholders. 3) Displacement is an undesirable outcome that takes place outside the project scope and it is not a major outcome considered by the project, leading to negative impacts to other projects. And 4) Benefit period and drop-off which can be concluded and shown in Table 2.

Step 5 - Calculating the SROI and report: The evaluated present value of the investment is 8,500,159 baht and the evaluated present value of economic, social, and environment returns is 12,848,744 baht. When SROI is evaluated, calculated from the present value of return on investment ratio to net present value of investment, it is equal to 1.51. It means that for every 1 baht of investment in the project, it shall generate outcomes or economic, social and environmental returns for 1.51 baht. It is considered that the biodiversity offset activity scheme with the cooperation between farmers and private agencies to propel green spaces is worthy of investment. Details are shown in Table 3.

Table 2 Impact identification from the project operations

Outcomes	Indicators	Benefits (Baht)	Deadweight		Attribution		Drop off (%)	Net Benefits (Baht/Year)	Total Benefits (Baht)	
			%	Remaining	%	Remaining				
Economic impact - members' economy is better	(1) Revenue generated from selling fruits and vegetables	Year 1	1,471,640	40	882,984	10	794,686	0	794,686	4,851,635
		Year 2	1,618,804		971,282		874,154		830,446	
		Year 3	1,780,684		1,068,411		961,570		913,491	
		Year 4	1,958,753		1,175,252		1,057,727		1,004,840	
		Year 5	2,154,628		1,292,777		1,163,499		1,105,324	
	(2) Revenue generated from selling flowering and ornamental plants	Year 1	1,790,000	60	716,000	10	644,400	5	644,400	2,915,511
		Year 2	1,790,000		716,000		644,400		612,180	
		Year 3	1,790,000		716,000		644,400		581,571	
		Year 4	1,790,000		716,000		644,400		552,492	
		Year 5	1,790,000		716,000		644,400		524,868	
	(3) Revenue generated from selling grafts of mango varieties	Year 1	50,000	0	50,000	0	50,000	0	50,000	450,000
		Year 2	100,000		100,000		100,000		100,000	
		Year 3	100,000		100,000		100,000		100,000	
		Year 4	100,000		100,000		100,000		100,000	
		Year 5	100,000		100,000		100,000		100,000	
	(4) Fertilizer cost reduction	Year 1	186,000	0	186,000	0	186,000	5	186,000	841,535
		Year 2	186,000		186,000		186,000		176,700	
		Year 3	186,000		186,000		186,000		167,865	
		Year 4	186,000		186,000		186,000		159,472	
		Year 5	186,000		186,000		186,000		151,498	
(5) Reduction of electricity cost from solar water pump system	Year 1	128,898	0	128,898	0	128,898	5	128,898	583,184	
	Year 2	128,898		128,898		128,898		122,453		
	Year 3	128,898		128,898		128,898		116,330		
	Year 4	128,898		128,898		128,898		110,514		
	Year 5	128,898		128,898		128,898		104,988		
Social impact	Employment takes place in the area	Year 1	267,840	0	267,840	0	267,840	5	267,840	1,211,810
Employment takes place in the area		Year 2	267,840		267,840		267,840		254,448	
place in the area		Year 3	267,840		267,840		267,840		241,726	

Outcomes	Indicators	Benefits (Baht)	Deadweight		Attribution		Drop off (%)	Net Benefits (Baht/Year)	Total Benefits (Baht)
			%	Remaining	%	Remaining			
Environmental impact (1) More green spaces are provided. (2) Creating the value of ecosystem services (3) Environment is better	(1) The value of perennial plants	Year 4 267,840		267,840		267,840		229,639	75,000
		Year 5 267,840		267,840		267,840		218,157	
		Year 3 25,000	0	25,000	0	25,000	0	25,000	
		Year 4 25,000		25,000		25,000		25,000	
		Year 5 25,000		25,000		25,000		25,000	
	(2) The value of ecosystem services	Year 1 1,087,812	40	652,687	40	391,612	0	391,612	2,390,832
		Year 2 1,196,593		717,956		430,774		430,774	
		Year 3 1,316,253		789,752		473,851		473,851	
		Year 4 1,447,878		868,727		521,236		521,236	
		Year 5 1,592,666		955,599		573,360		573,360	
(3) Reducing environmental cost from using solar system	Year 1 25,623	0	25,623	0	25,623	5	25,623	115,926	
	Year 2 25,623		25,623		25,623		24,341		
	Year 3 25,623		25,623		25,623		23,124		
	Year 4 25,623		25,623		25,623		21,968		
	Year 5 25,623		25,623		25,623		20,870		

Table 3 Social return from investment according to the 5-year biodiversity offset action plan (unit: baht)

Outcomes	Year 1	Year 2	Year 3	Year 4	Year 5	Total Result Value
Economy	1,803,984	1,885,487	1,927,336	1,980,205	2,044,853	9,641,865
Society	267,840	254,448	241,726	229,639	218,157	1,211,810
Environment	417,235	455,115	496,975	543,204	594,230	2,506,758
Total value of outcomes	2,489,058	2,595,050	2,691,037	2,778,048	2,882,240	13,435,434
Net present value of outcomes	2,452,975	2,520,356	2,575,691	2,620,427	2,679,295	12,848,744
SROI	12,848,744/8,500,159 = 1.51					

Conclusion and Discussion

The study results according to Objective 1 found biodiversity offset activity schemes appropriate to Khung Bangkachao are 1) financial support, 2) support of production factors (fertilizer), and 3) support of solar water supply system, which can be offered as an option for private agencies to make consideration for providing support accordingly. It is noticeable from the study of Chaiphair et al. (2012) on payment for ecosystem services that the community and relevant persons lacked knowledge and understanding about the concepts and practical guidelines and they did not view the relation of payment for ecosystem services and allocation of remuneration to caretakers. In this regard, additional study should be conducted on guidelines and conditions of direct financial support to farmers. Therefore, the initial operation of the project should focus on support for fertilizer or solar water supply system to achieve tangible outcomes. Chaisangduean et al. (2018) conducted a study on the application of incentive measures for conservation and utilization of biodiversity to Thailand, and found that action should be taken for making a change in policies to support the evaluation of economic values and benefits explicitly. Incentive measures should consist of 1) legal measures, financial and fiscal policies, 2) economics measures and 3) social measures and participation.

The study results according to Objective 2 found social return on investment (SROI) of the biodiversity offset action plan of Khung Bangkachao was 1.51. It means that for every 1 baht of investment in the project, it shall generate outcomes or economic, social and environmental returns for 1.51 baht. Economic outcomes are expected: farmers generate more income, cost of fertilizers, and electricity cost can be reduced. In terms of social outcome, employment in the area is available. With regard to environmental outcomes, the value of ecosystem services is generated and environmental cost is reduced. It is consistent with Hunter et al. (2022) who conducted a study on a plan to make green spaces or water sources that shall connect to each other as a network in Belfast, North Ireland. A SROI model was made and impact assessment was conducted in terms of the values of land and property, flood mitigation, tourism, employment, the quality of places, climate change, and health as academic evidence for making decision to implement the project. The study results found SROI ranged from 2.88 (worst case scenario) to 5.81 (best case scenario). As for studies conducted in Thailand, Naksanee et al. (2022) conducted a study on social return on investment from community enterprise business to promote sports tourism in the organization of Chom Bueng Marathon: a case study of Uyenpensook Thai-Mon folkway Learning Center, and found SROI was 6.73, meaning that 1 baht from the Learning Center's operations has contributed to the society equal to 6.73 baht. The arising outcomes brought about employment and income distribution in the community while the environment was improved. Jiaromas (2019) summarized the results from electricity generation from RDF that SROI ranged from -1.00 to 12.65 within the 20 years project. Economic return was electricity consumption in the community, social return was local employment and environmental return was income generated from carbon credit trading.

Suggestion for Research Result Application

- 1) Private agencies are able to determine corporate policies to support biodiversity offset activity scheme in the form of a budget for CSR activities. Initially, support can be given to factors of production, such as fertilizer and solar water system since they are not complicated. As for financial support given directly to farmers, a study should be conducted on guidelines and conditions before the support is given.
- 2) Government agencies are able to use the study results, especially SROI values showing the worthiness of the operations according to the biodiversity offset action plan, as the information to motivate or develop cooperation among farmers, private agencies including using as a policy suggestion for conservation and restoration of biodiversity.

Suggestion for Future Research

- 1) An additional study should be conducted on guidelines and conditions of financial support.

- 2) An additional study should be conducted on social indicators that cannot be evaluated by value, such as benefits from group gathering, benefits from obtaining knowledge, etc.
- 3) An additional study should be conducted in case green spaces are increased more than 10% like 20% or 30%.

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