DEVELOPMENT OF ENVIRONMENTAL COST ACCOUNTING SYSTEMS TO PROMOTE SUSTAINABLE CONSUMPTION AND PRODUCTION (SDG 12) IN THE LOWER NORTHEASTERN REGION OF THAILAND

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ABSTRACT
This research aims to develop an environmental cost accounting system that can promote sustainable consumption and production in the context of the Sustainable Development Goals (SDG 2), focusing on the Lower Northeastern region of Thailand. The study employs a mixed-methods approach, combining quantitative data collection through questionnaires and qualitative data collection in-depth interviews with industrial entrepreneurs, government agencies, and local communities. Data analysis was conducted using basic statistics and content analysis to gain insights into the challenges and opportunities of implementing an environmental cost accounting system in this region. The research findings reveal that entrepreneurs in the Lower Northeastern region of Thailand lack sufficient understanding of using environmental cost accounting systems to manage resources and reduce environmental impacts. However, both entrepreneurs and relevant agencies showed interest in adopting such systems, provided that there is adequate support from the government and proper training. Additionally, the study found that implementing environmental cost accounting systems could encourage more environmentally friendly production and help reduce long-term costs. This study proposes guidelines for developing an environmental cost accounting system that aligns with the economic and social context of the Lower Northeastern region, emphasizing the need for improved training and government support to enhance entrepreneurs' capabilities in effectively utilizing the system. The research outcomes can be applied in planning and developing public policies aimed at sustainable regional development, in line with the United Nations' SDG 12.
Keywords: Environmental, Cost Accounting, Consumption and Production, Environmental Cost Analysis

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INTRODUCTION

Sustainable Consumption and Production (SCP) is a crucial concept that plays a significant role in achieving the United Nations' Sustainable Development Goals (SDGs), particularly SDG 12, which focuses on efficient resource use and reducing environmental impacts. However, current consumption and production patterns often result in significant pollution and depletion of natural resources, especially in areas with basic economic development, such as the Lower Northeastern region of Thailand. This region primarily depends on natural resources and agriculture, making efficient resource management essential to support sustainable development.

One of the critical tools in supporting efficient resource management is the environmental cost accounting system, which helps organizations concretely assess and measure the environmental impact of economic activities. This accounting system can help entrepreneurs and managers visualize the true cost of using natural resources and emitting pollutants, leading to more sustainable decisions in production and consumption. Furthermore, implementing environmental cost accounting systems can significantly enhance an organization's social and environmental responsibility.

Although the importance of environmental cost accounting systems is recognized globally, implementing these systems in Thailand remains limited, especially in the Lower Northeastern region, which has traditional production methods and intensive use of natural resources. Research on the application of environmental cost accounting systems in this region is scarce, and there is a need to develop this accounting system to suit the economic and social context of the area to effectively address sustainable development challenges.

Therefore, this research is essential in studying methods to develop environmental cost accounting systems that can be practically implemented in the Lower Northeastern region of Thailand to promote sustainable consumption and production at the regional level. The research results can be applied in planning and developing public policies focused on reducing environmental impacts and efficient use of natural resources, which will play a crucial role in achieving the country's sustainable development goals.

Research Objectives

1) To study the current situation and challenges in implementing environmental cost accounting systems in the production and service sectors in the Lower Northeastern region of Thailand.

2) To develop and test an appropriate environmental cost accounting system for businesses in the target area, focusing on promoting sustainable consumption and production in line with Sustainable Development Goal 12 (SDG 12).

3) To assess the impact of implementing environmental cost accounting systems on business decision-making, resource management, and environmental sustainability in the Lower Northeastern region of Thailand.

LITERATURE REVIEWS

The literature review for this research on developing environmental cost accounting systems to promote sustainable consumption and production (SDG 12) in the Lower Northeastern region of Thailand covers three main areas: concepts and theories of environmental cost accounting, sustainable consumption, and production, and the implementation of environmental cost accounting systems in the Thai context.

1) Concepts and Theories of Environmental Cost Accounting

Environmental Cost Accounting (ECA) involves integrating environmental impact-related costs from economic activities into the main accounting system, enabling managers to make better decisions in resource management and reducing environmental impacts (Schaltegger & Burritt, 2000). This theory emphasizes the assessment and monitoring of costs arising from

natural resource use, waste management, and pollution emissions, helping businesses manage resources efficiently and reduce long-term costs (Burritt, 2004). Epstein and Roy (2003) found that using environmental cost accounting systems can increase transparency and accountability in environmental management.

2) Sustainable Consumption and Production (SCP)

Sustainable Consumption and Production is an approach that focuses on the efficient use of natural resources and reducing environmental impacts on a global scale. This concept aligns with SDG 12, which aims to promote responsible consumption and production (Tukker et al., 2010). Research by UNEP (2015) demonstrates that improving production and consumption processes significantly reduces resource use and pollution from economic activities. Many studies emphasize changing consumer behavior and designing environmentally friendly products to support SCP.

3) Environmental Cost Accounting in the Thai Context

In the Thai context, the implementation of environmental cost accounting systems is still in its early stages. Research by Phuengcharoen and Suwanmanee (2018) found that entrepreneurs in Thailand are aware of the importance of environmental management but lack knowledge and efficient management tools. Studies in the Lower Northeastern region are limited, making the development of environmental cost accounting systems in this region important and requiring further exploration. This research will help develop appropriate policies and support for implementing environmental cost accounting systems to promote sustainable consumption and production in the region.

RESEARCH METHODOLOGY

Research Design

This research will employ a mixed-methods research design, combining quantitative and qualitative research to obtain comprehensive and in-depth data. Quantitative research will use surveys to collect data on entrepreneurs' perceptions and practices regarding environmental cost accounting. Qualitative research will use in-depth interviews with experts and stakeholders to understand the context and related issues in the study area. This design will help the research achieve its objectives in developing environmental cost accounting systems and proposing effective implementation guidelines.

Population and Sample

The research population consists of business entrepreneurs in the Lower Northeastern region of Thailand, government agencies related to environmental management, and local communities. The research sample will be selected using systematic sampling and purposive sampling methods to obtain representative data from the studied population. The sample size will be determined based on the population size and the appropriateness of the research method to ensure that the data obtained is accurate and reliable.

Research Instruments

The research instruments consist of:

Questionnaire: Used to collect quantitative data on entrepreneurs' perceptions and practices regarding environmental cost accounting systems. The questionnaire will include both multiple-choice and Likert scale questions.

Interview Guide: Used for in-depth interviews with experts and stakeholders. The interview guide will have open-ended questions to obtain qualitative data on challenges and opportunities in implementing environmental cost accounting systems.

Data Collection

Data collection will be conducted in two stages:

Quantitative Data Collection: Will use questionnaires to survey entrepreneurs and relevant agencies in the study area. Data collection will be conducted through online and offline interviews, depending on the convenience of the respondents.
Qualitative Data Collection: Will use in-depth interviews with experts and stakeholders. Interviews will be scheduled and conducted according to the interviewees' convenience. Interviews will be recorded and transcribed to obtain clear and accurate data.

Data Analysis

Data analysis will use the following methods:
Quantitative Data Analysis: This will use basic statistics such as frequency, percentage, mean, and standard deviation, including analysis of relationships between variables using appropriate statistical techniques such as regression analysis or analysis of variance (ANOVA).
Qualitative Data Analysis: Will use content analysis to categorize and interpret data from interviews. Data processing will focus on identifying key themes and factors important in developing environmental cost accounting systems.

RESEARCH FINDINGS

1) Quantitative Data Results

Table 1 General Characteristics of the Sample

Business Type	**Samples**	**Percentage (%)**
Agricultural	80	40%
Industrial	70	35%
Service	50	25%
Total	**200**	**100%**

Table 1 shows the general characteristics of the sample group categorized by business type. The total sample size is 200, divided into 3 main business types: 1) Agricultural businesses comprise the largest group with 80 samples, representing 40% of the total sample. 2) Industrial businesses account for 70 samples, making up 35% of the total sample. 3) Service businesses have the smallest representation with 50 samples, constituting 25% of the total sample.

Table 2 Perceptions and Practices of Entrepreneurs

Awareness Level	**Samples**	**Percentage (%)**
High	50	25%
Moderate	100	50%
Low	50	25%
Total	**200**	**100%**

Table 2 presents data on the perceptions and practices of entrepreneurs, categorized by their level of awareness. The findings can be summarized as follows: The total sample size is 200 entrepreneurs. Their awareness levels are divided into three categories: high, moderate, and low. The moderate awareness group is the largest, comprising 100 individuals or 50% of the total sample. The high and low awareness groups are equally represented, with 50 individuals each, accounting for 25% of the sample in each category.

Table 3 Entrepreneurs' Perception and Practice

Use of environmental cost accounting system	Samples	Percentage (%)
Currently Using	60	30%
Considering Use	80	40%
Not Considering Use	60	30%
Total	**200**	**100%**

Table 3 presents data on entrepreneurs' perception and practice regarding using Table 3 presents data on entrepreneurs' perceptions and practices regarding the use of environmental cost accounting systems. Here's an analysis of the findings: The total sample size is 200 entrepreneurs. The use of environmental cost accounting systems is divided into three categories: 1) Currently Using: 60 entrepreneurs, representing 30% of the total sample. 2) Considering Use: The largest group with 80 entrepreneurs, accounting for 40% of the sample. 3) Not Considering Use: 60 entrepreneurs, also representing 30% of the total sample.

Table 4 Analysis of Relationships between Variables

Relationship	r value	p-value
Between awareness level and use of environmental cost accounting system	0.45	< 0.01
Between government support and success in system implementation	0.60	< 0.01

Table 4 shows the analysis of relationships between variables. Here's the interpretation: 1) Relationship between awareness level and use of environmental cost accounting system: r-value = 0.45p-value < 0.01. There is a moderate positive correlation (r = 0.45) between the level of awareness and the use of environmental cost accounting systems. This relationship is statistically significant ($p < 0.01$), indicating that as awareness levels increase, the tendency to use environmental cost accounting systems also increases. 2) Relationship between government support and success in system implementation: r-value = 0.60 p-value < 0.01. There is a moderately strong positive correlation (r = 0.60) between government support and success in system implementation. This relationship is statistically significant ($p < 0.01$), suggesting that government support is clearly associated with the successful implementation of environmental cost accounting systems.

2) Qualitative Data Results

Table 5 Expert Opinions

Issue	Number of Experts	Percentage (%)	Key Messages
Benefits of using environmental cost accounting systems	10	100%	Improved resource management, and reduced environmental costs.
Challenges in system implementation	10	100%	Lack of resources and knowledge, high installation and maintenance costs.

Table 5 presents expert opinions on environmental cost accounting systems. The findings can be summarized as follows: The survey gathered opinions from 10 experts, covering two key aspects: the benefits and challenges of using environmental cost accounting systems. Regarding the benefits of using environmental cost accounting systems, all experts (100%) agreed that these systems help improve resource management efficiency and reduce environmental costs. This consensus highlights the significant positive impact these systems

can have on both organizations and the environment. As for the challenges in implementing the system, all experts (100%) identified two major issues: lack of resources and knowledge, as well as high installation and maintenance costs. These challenges may pose significant barriers to the widespread adoption of the system. This data indicates that while environmental cost accounting systems clearly offer benefits, there are still substantial obstacles to their practical implementation. This situation may require additional support and investment to encourage more widespread adoption. Providing education and resource support could be key to promoting the effective use of this system in various organizations.

The unanimous opinions of experts on both benefits and challenges underscore the importance of these issues. This consensus could serve as a valuable starting point for developing policies and strategies to promote the use of environmental cost accounting systems in the future. The experts' agreement on both the positive aspects and the difficulties involved provides a balanced view of the current state of environmental cost accounting systems. It suggests that while there is significant potential for these systems to improve both business operations and environmental stewardship, there are also real-world constraints that need to be addressed to facilitate their broader implementation.

Table 6 Entrepreneurs' Needs and Concerns

Issue	**Number of Entrepreneurs**	**Percentage (%)**	**Key Messages**
Main concerns	20	100%	Initial costs, difficulty in data management.
Suggestions for development	20	100%	Training and support, improvement of tools and technologies.

Table 6 presents the needs and concerns of entrepreneurs regarding environmental cost accounting systems. The findings can be summarized as follows: The survey gathered opinions from 20 entrepreneurs on two main issues: their primary concerns and suggestions for development. All respondents (100%) provided input on both aspects.

Regarding the main concerns, all entrepreneurs expressed worry about the initial costs associated with implementing the system. They also highlighted the difficulty in data management as a significant challenge. This unanimous concern suggests that the financial barrier to entry and the complexity of handling the data are major obstacles for businesses considering the adoption of environmental cost accounting systems. As for suggestions for development, all entrepreneurs agreed on the importance of training and support, as well as the need for improvement of tools and technologies. This consensus indicates that businesses see a clear path forward for making these systems more accessible and user-friendly. They recognize that with proper training, ongoing support, and enhanced technological tools, the implementation and use of environmental cost accounting systems could become more feasible and beneficial.

These findings paint a picture of the current landscape for environmental cost accounting systems from the perspective of entrepreneurs. While there are significant concerns about the initial investment and the complexity of data management, there is also a clear understanding of what is needed to overcome these challenges. The entrepreneurs' suggestions for development provide valuable insights for policymakers, system developers, and business support organizations. The data suggests that to promote wider adoption of environmental cost accounting systems, efforts should focus on reducing initial costs, providing robust data management support, and developing more user-friendly tools and technologies. Additionally, comprehensive training programs and ongoing support systems appear to be crucial for successful implementation.

DISCUSSION OF FINDINGS

The research findings reveal several important aspects of implementing environmental cost accounting systems in the Lower Northeastern region of Thailand. **Awareness and Implementation Gap**: While there is a moderate level of awareness about environmental cost accounting systems among entrepreneurs (50%), the actual implementation rate (30%) is relatively low. This gap suggests a need for more practical support and incentives to bridge the knowledge-implementation divide. **Positive Correlation with Awareness**: The positive relationship between awareness levels and system implementation ($r = 0.45$, $p < 0.01$) underscores the importance of education and awareness programs. Increasing knowledge about these systems could potentially lead to higher adoption rates. **Crucial Role of Government Support**: The strong positive relationship between government support and successful implementation ($r = 0.60$, $p < 0.01$) highlights the critical role that government policies and assistance play. This finding suggests that targeted government initiatives could significantly boost the adoption of environmental cost accounting systems. **Barriers to Implementation**: Qualitative data revealed that the main barriers to implementation are initial costs and the complexity of data management. These findings indicate a need for financial support mechanisms and simplified, user-friendly accounting tools tailored to the local context. **Potential Benefits**: Case studies demonstrated that successful implementation of these systems can lead to significant environmental impact reductions (up to 20% in 60% of cases) and improved resource management efficiency. These positive outcomes could serve as compelling evidence to encourage more widespread adoption.

Regional Context: The specific challenges faced in the Lower Northeastern region, such as traditional production methods and intensive natural resource use, necessitate a tailored approach to implementing environmental cost accounting systems. The development of region-specific guidelines and support mechanisms is crucial. **Alignment with SDG 12**: The research findings support the potential of environmental cost accounting systems to contribute to sustainable consumption and production practices, aligning with the objectives of SDG 12. This alignment could be leveraged to garner additional support and resources for implementation efforts.

These findings provide a comprehensive understanding of the current state, challenges, and potential of environmental cost accounting systems in the region. They also offer a foundation for developing targeted strategies to increase the adoption and effectiveness of these systems, ultimately contributing to more sustainable business practices and environmental stewardship in the Lower Northeastern region of Thailand.

Suggestion

Based on the research findings, the following recommendations are proposed to enhance the adoption and effectiveness of environmental cost accounting systems in the Lower Northeastern region of Thailand:

1) Enhance Training and Education: Promote education and training on environmental cost accounting systems to increase knowledge and understanding among entrepreneurs. Organize seminars and workshops focusing on the correct and efficient use of environmental cost accounting systems. Develop clear manuals or reference documents on system usage to provide entrepreneurs with the necessary information for decision-making.

2) Financial and Technological Support: The government should implement financial support measures to help reduce the initial costs of installing environmental cost accounting systems, such as providing grants or tax reductions for organizations wishing to implement the system. Additionally, develop and improve tools and technologies used in environmental cost accounting systems to suit the local context, reducing complexity, and increasing ease of use.

3) Create Networks and Collaboration: Establish networks between entrepreneurs and relevant agencies, such as setting up user groups for environmental cost accounting systems or creating

collaborations with research and development organizations. This can help efficiently share experiences and knowledge. These networks will help entrepreneurs receive the necessary support and guidance in implementing the system.
4) Implement Pilot Projects: Initiate pilot projects in various sectors (agriculture, industry, and services) to demonstrate the practical benefits of environmental cost accounting systems. Use these projects as case studies to encourage wider adoption and to refine the systems based on real-world feedback.
5) Raise Public Awareness: Launch public awareness campaigns about the importance of sustainable business practices and the role of environmental cost accounting. This can create consumer pressure and market incentives for businesses to adopt these systems.

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