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# Cost-benefit analysis of waste segregation business in Amnatcharoen province, Thailand

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**Abstract** The cost-benefit analysis of waste recycling and separating business in Senangkhanikom District, Amnatcharoen Province, Northeastern Thailand was studied. Results showed the Net Present Value (NPV) was 313,502 baht. The Internal Rate Return (IRR) and Payback Period (PB) were 8% and 4.5 years, respectively. Problems and obstacles reports were in the medium level ($\bar{X}$ = 3.35). It was found that the most problems and obstacles of the business was marketing ( $\bar{X}$ = 4.23). The rest of the problems and obstacles were the lack of technology ($\bar{X}$ = 3.84) and financial liquidity as well as cash holdings for buying products ($\bar{X}$ =2.76), respectively. It is recommended that the business could grow its profits and satisfactory investment as well as could help to improve the communities in many aspects such as making money by selling waste materials, reducing pollutants into the environment, and building a better living environment.

**Keywords:** Cost-benefit analysis; recyclable waste; waste segregation business

## Introduction

Recently, environmental problems due to the increasing amount of garbage from the economic development and the expansion of the community. Based on data from the Department of Pollution Control (Thailand Pollution Report, 2015), it is found that around 70,000 tons of solid waste a day were properly collected and transported only approximately 22,000 tons per day (32%). The remaining has been collected but not removed. Some of them are left at the disposal site. Furthermore, there are also some wastes that have not used garbage collection service.

At present, there is a recycling business. Many people generally think that recycled products are not interesting but there is a large demand of recycled products in the domestic market. The demand for recycled products in the country is high. As a result, the recycling business is a business that has

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been operating for a long time. It serves as an intermediary for the collection of consumable materials, but still valuable and can be reused effectively. By adapting new technology for the appropriateness of learning, the consideration of social and environmental make the business sustainable, highly flexible including the development of social and community (Yannada Sirapatthada, 2010).

In the area of Senangkhanikhom and Siri Senang Subdistrict, Senangkhanikhom District, Amnat Charoen Province, there are a number of recycling businesses. For a large business, the company will collect garbages, separate them, combine each type of garbages and send them to the factory regarding to its requirement. In the case that some garbage is in a big demand, they may be sent once a week. In order to recycle wastes and sell to major merchants, they normally depend on the harvest season. For example, during the harvest season, there will be less people to recycle the waste for sale. Therefore, the wastes that are sold are from household waste which can be separated and sold as an extra income as shown in Figure 1.

**Figure 1.** The area of recycling business in Senangkhanokhom District, Amnatcharoen Province

Regarding to this problem, the researcher has realized the importance of the costs and benefits of recyclable waste for recycling, adding value to waste by reducing the amount of waste at the original source and making the community awares of the value of waste for recycling. Therefore, the research is conducted on cost analysis and the return of recycling waste business in Amnatcharoen Province. It generates incomes with less cost. Waste management is effective. Moreover, it reduces waste at the original source. It is also an opportunity to help the community's landscapes become more beautiful, reduce pollution and increase the quality of life. The objectives were to study the cost and benefit of the recycling business in Senangkhanikhom District, Amnatcharoen Province, Northeastern Thailand.

## Materials and methods

### *Sample and Population*

The number entrepreneurs in the recycling business in Senangkhanikhom District, Amnatcharoen Province was noted. It consisted of a group of people who selected from the original source, a group of the middleman and a group of reclying business counted as thirteen units. Thirteen recycling businesses in Senangkhanikhom, Amnatcharoen Province was sampling. The samples were selected by purposive sampling which registered for public sale and junk trade.

### *Research Method*

This research used as a questionnaire on the cost and return of the waste seperating business for recycling and the value-added of waste seperating in terms of recycling business in Senangkhanikhom District, Amnatcharoen Province. This included Part 1 General information of waste recycling and separating business, Part 2 Detail of the structure of the junk trade, Part 3 Type / proportion of waste, Part 4 Costs / benefit of the junk trade, Part 5 Business performance, Part 6 Operating results of the business and Part 7 Problems and obstacles.

### *Create and Find Quality of Methods*

A questionnaire on costs and benefit analysis of waste recycling business in Senangkhanikhom District, Amnatcharoen Province created and found quality of the methods as follows:-1) to study the information on the cost and benefit analysis of the waste separation for recycling business, 2) to prepare the

questionnaire on the cost and benefit analysis of the waste separation for recycling business in Senangkhanikhom District, Amnatcharoen Province, 3) to find content validity, 4) to determine the validity by bringing the questionnaire to the specialists for reviewing and considering the structure of the questionnaire, content appropriateness. There were 5 specialisits, 5) To update and improve the questionnaire according to specialists' recommendations, and 6) to find the reliability. The researcher was applied the questionnaire to the sample (Tyr out) with the sample of 5 actual users and calculated the reliability, using Cronbach's Coefficient Alpha formula.

### *Data Collection*

Data were gathered by two different forms as: secondary and used to investigate information from books, journals, articles, academic papers and other related websites and primary data were collected by using questionaires, interviews, observations alonging with notes and test with the Triangulation. Data were analyzed including Descriptive Statistics, Percentage, Mean, Standard Deviation, Reliability, Coefficient Alpha Cronbach (Cronbac197., 161).

## Results

### *General Information of Recycling Business*

It was shown that most of the entreprenuers are male counted as 53.80% and women as 46.20%. Most of the entrepreneurs' ages are between 41-50 years counted as 61.50%, following with age over 51 years as 30.80%. The education levels of the entreprenuers were mostly undergraduate counted as 76.90%, followed by bachelor degree as 23.10%. Most of them had more than 5 years of experience which counted as 38.50%, followed by 1-2 years and 3-4 years which counted as 30.80% (Table1).

### *Structure of Recycling Business*

It was found that the status of the recycling business was mostly personal counted as 61.50%, next was group of person as 30.80%, and partnership as 7.70% respectively (Table 2).

**Table 1.** Amount and percentage of recycling business entreprenuerships classified by gender, age, education and junk trade experience (n = 13)

| Personal Information | Amount (Person) | Percentage |
|---|---|---|
| **1. Gender** | | |
| Male | 7 | 53.80 |
| Female | 6 | 46.20 |
| 2. **Age** | | |
| Between 30-40 years | 1 | 7.70 |
| Between 41-50 years | 8 | 61.50 |
| Over 51 years | 4 | 30.80 |
| **3. Education** | | |
| Undergraduate | 10 | 76.90 |
| Bachelor Degree | 3 | 23.10 |
| **4. Junk Trade Experience** | | |
| Between 1-2 years | 4 | 30.80 |
| Between 3-5 years | 4 | 30.80 |
| Over 5 years | 5 | 38.50 |

**Table 2**. Amount and percentage of recycling business entreoreneurships classified by business status (n = 13)

| Business Status | Amount (Person) | Percentage |
|---|---|---|
| Personal | 8 | 61.50 |
| Group of Person | 4 | 30.80 |
| Partnership | 1 | 7.70 |
| Corporate | 0 | 0.00 |

### *Type / Proportion of Waste*

It showed the proportion of waste in the community which most of the waste is plastic at about 5,090 (kilogram/month), followed by paper at 4,500 (kilogram/month), and the lowest is tyre at 700 (kilogram/month) as seen in Table 3.

**Table 3**. Proportion of community's waste classified by types (n=13)

| Waste Classification | Proportion (Kilogram/Month) |
|---|---|
| Plastic | 5,090 |
| Glass | 3,000 |
| Metal | 3,900 |
| Paper | 4,500 |
| UTH Box | 3,500 |
| Can | 3,000 |
| Alluminium | 2,550 |
| Tyre | 700 |
| Others | 500 |

### *Costs / benefit of Recycling Business*

The Net Present Value (NPV) was 313,502 baht; the Internal Rate Return (IRR) and Payback Period (PB) were 8% and 4.5 years, respectively (Table 4).

### *Business Performance*

It showed that most of the business sources was from retail customers counted as 69.20%, following with corporates, government services and business organization counted as 30.80% (Table 5). It was found that selling recycle products revealed mostly to both the middleman anddirectly to the manufacturer counted as 53.80%, and followed by selling to the middleman which counted as 38.50% and sell directly to the manufacturer counted as 7.70% (Table 6).

### *Problems and Obstacles*

The problems and obstacles of recycling business are found at the medium level ($\overline{X}$ = 3.35). Considering by each problems, it is found that the most problem is marketing ($\overline{X}$ = 4.23), followed by technology ($\overline{X}$ = 3.84) and labour ($\overline{X}$ = 3.61). The least problems and obstacles is financial liquidation on holding cash for buying materials ($\overline{X}$ = 2.76) as seen in Table 7.

**Table 4.** Costs / benefit s of recycling business (n=13)

| Items | Net Present Value (NPV)/ Baht | Internal Rate Return (IRR)/ Percentage | Payback Period (PB)/ Year |
|---|---|---|---|
| Costs / benefit | 313,502 | 8 | 4.5 |

**Table 5.** Number and percentage of the business performance classified by recycle source of the business (n = 13)

| Recycle Source of the Business | Amount (Person) | Percentage |
|---|---|---|
| Retail customers | 9 | 69.20 |
| Corporates, Government services and Business organization | 4 | 30.80 |

**Table 6.** Amount and percentage of selling recycle products (n = 13)

| Selling Recycle Products | Amount (Person) | Percentage |
|---|---|---|
| Sell directly to the manufacturer | 1 | 7.70 |
| Sell to the middleman | 5 | 38.50 |
| Sell to both | 7 | 53.80 |

**Table 7.** Percentage and standard diviation of problems and obstacles in the business (n = 13)

| Items | $\overline{X}$ | S.D. | Level |
|---|---|---|---|
| **Factors that effect on the operation** | | | |
| 1. Labour | 3.61 | 1.12 | Most |
| 2. Technology | 3.84 | 1.14 | Most |
| 3. Marketing | 4.23 | 0.92 | Most |
| 4. Rules and regulations | 3.38 | 0.65 | Medium |
| 5. Places | 2.84 | 0.89 | Medium |
| **Financial Problems** | | | |
| 1. No funding from the financial institutions | 3.15 | 1.14 | Medium |
| 2. Unsystematically accounting | 3.00 | 1.15 | Medium |
| 3. Financial liquidation on holding cash for buying materials | 2.76 | 1.16 | Medium |
| **Overall** | **3.35** | **1.02** | **Medium** |

## Discussion

The status of the recycling business in Senangkhanikhom District, Amnat charoen Province was most individuals, followed by group of person and partnerships. In the part of waste proportion, it is regarded with the reseach of Marasri Jadsadapatipat (2009) on the topic of Resource Characteristics, Firm's Capabilities and Entrepreneur's Abilities Influencing Firm's Performance: Case of Recyclable Waste Collecting and Buying Business in Eastern Thailand.

The results showed that waste collecting and recycling business or recycling business in the Eastern Thailand operated as a family business. In addition, it also operated in the form of a franchise. Most of the recycling materials are plastics, following with paper and the smallest is the tyre.

The costs and benefit for operating recycling business, it is found that the Net Present Value (NPV) was 313,502 baht. The Internal Rate of Return (IRR) and Payback Period (PB) were 8% and 4.5 years respectively. The research of Panya Lertthaisong and Chanya Apiparnkul (2015) on the topic of the Study of the Possibility for Staring Junk Trade in Klaeng District, Nakhon Ratchasima showed that the total investment was 1,779,000 baht, the Net Present Value (NPV) was 275,912.52 baht, and the Internal Rate of Return (IRR) and Payback Period (PB) were 8% and 4.2 years repectively.

The performance of the business showed that the majority of customers of recycling business was mostly retail customers, followed by corporate, government services and business organizations. Most of the recyclable materials were both sold directly and through the middleman, following with sell through the middleman and sell directly to the manufacturers. This results were in line with the research conducted by Wanwisa Tongla (2011) on the topic of the Business Adjustment for Survival of Solid Waste Materials Business in Commerial Society. It was found that many people were interesting in doing recycling business. As as result, the existed entrepreneurs had to adjust their business in order to survive in the recycle market. The source of recycling materials were from trolleys and pick-up trucks which would sell these waste materials to the recycling business. After that, the recycling business would separate all wastes and sell to the major recyclers or processing plants.

The problems and obstacles of the recycling business were around at a moderate level. When considering each item, it was found that most problems and obstacles of the recycling business were marketing, followed by technology and labour. This results was not in line with the study of Thananon Simmakul (2014) on the topic of Marketing Strategy for Recycle Factory in Thailand. The research revealed that the characteristics of the management for the waste recycling business with extensive experience in the management of waste recycling business can apply the appropriate technology and make a difference in the service with a good performance.

It is recommended to provide market sources and qualified factories with the standard of the price and price insurance, encourage the recycling business to have the opportunity of funding from the government financial institutions.The results should be used to analyze the environment both internally and externally in the situations that several factors would constantly effect on the recycling business. In addition, financial analysis should be studied in order to compare with the economic analysis. The users' satisfaction on the recycling service in other aspects should be compared with the results in this research in terms of the users' needs in the marketing mix of each aspect, which can be used as a strategy to continue the business.

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