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Developing Value-added, Community-appropriate Options for Repurposing of Wasted Juice Cartons

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Submitted on March 3rd, 2017
Developing Value-added, Community-appropriate Options for Repurposing of Wasted Juice Cartons in Chiang Rai, Thailand

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This report represents the work of four WPI undergraduate students and four Chulalongkorn University students submitted to the faculty as evidence of completion of a degree requirement. WPI routinely publishes these reports on its website without editorial or peer review. For more information about the projects program at WPI, please see: http://www.wpi.edu/Academics/Projects

Project Sponsored by Doi Kham Food Products Co. Ltd.

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Abstract

As an unavoidable byproduct of their manufacturing processes, thousands of wasted juice cartons accumulate daily at Doi Kham Food Products' juice packaging factory in Chiang Rai, Thailand. Furthermore, this waste cannot be managed because there are no recycling facilities in the area. Our goal was to find solutions for repurposing the wasted juice cartons in a way that benefitted the community. Our team evaluated Doi Kham's problem and expectations, assessed the needs of the community, and analyzed the feasibility of different reuse programs. We developed three effective and beneficial solutions: a microenterprise plan that will strengthen Doi Kham’s community relations, an educational reuse program for local schools, and a partnership between Doi Kham and a recycling company.
Executive Summary

Problem

Doi Kham Food Products Co Ltd. is currently facing a waste generation problem at their juice factory located in the Chiang Rai province. The factory currently produces over 3,000 wasted juice cartons every day as a byproduct of their manufacturing process. With no recycling plants nearby, the wasted cartons are currently building up at a local waste facility. Doi Kham has asked us to find repurposing or recycling solutions for the waste that benefit the local community.

Background

Doi Kham was founded in 1969, under his majesty King Bhumibol Adulyadej, as a Royal Foundation project initiative designed to provide an alternative source of income to opium poppy farming. While the company now operates independently from the Royal Foundation, the original Corporate Social Responsibility (CSR) goals and community focus of the late King are still fundamental to the company.

In conjunction with their CSR goals, Doi Kham is also focused on minimizing the negative environmental effects of their manufacturing process. Waste generation is rapidly increasing around the world and packaged food containers, such as the ones that Doi Kham produces, are significant contributors to the waste problem. For this reason, Doi Kham has made it a goal to mitigate the detrimental effects of their waste production.

Project Goal

The goal of our project was to develop the most effective and feasible plan for repurposing Doi Kham Food Products’ waste juice cartons in order to benefit the Pa Sang community.
Methodology

To achieve our goal we toured the Doi Kham factory in Mae Chan and interviewed Doi Kham employees and community members, to determine the current waste situation and the expectations for the project. We researched and contacted recycling organizations in Thailand and worldwide, that are familiar with beverage carton waste problems. Using the information from our research and interviews we evaluated possible reuse techniques based on their feasibility and the impacts they would have on Doi Kham and the local community. Finally, we developed microenterprise and corporate partnership plans that would best fulfill Doi Kham’s CSR and waste management goals.

Key Finding One:

Doi Kham’s equipment and manufacturing process is extremely productive at approximately 99 percent efficiency. For this reason, the team determined that altering the machinery or production process would not be a feasible solution to the waste problem. There are several sources and types of waste being generated, but wasted beverage cartons are the most abundant and concerning.

Key Finding Two:

Both Doi Kham and the community expressed interest in making upcycled goods, such as baskets, from the wasted juice cartons, and in incorporating reuse programs into local schools’ curriculums. These projects could serve as an alternative source of income for community members, and could spread awareness of reuse throughout the community. However, due to the large volumes of waste being generated, Doi Kham wanted to find a solution that could manage the entirety of the waste produced. For these reasons, Doi Kham decided they needed multiple options that, enacted together, could fulfill their CSR goals and manage all the waste.

Key Finding Three:

We learned that Doi Kham is very interested in forming a partnership with a recycling organization to manage all of their waste. After contacting several recycling companies in Thailand and around the world, the Thai company Fiber Pattana seemed best fit to form a partnership with Doi Kham. This is because we discovered that Fiber Pattana’s CSR ambitions are synonymous with Doi Kham’s ambitions. In their not-for-profit accounts, donated wasted cartons are recycled into products which Fiber Pattana donates back to victims of natural disasters. The paper pulp byproduct from these donations, and the ensuing sales from Fiber Pattana’s ‘Eco-Paper’ products, allows the company’s not-for-profit account to be economically feasible.
Reccomendations

We recommend an agreement and partnership to be formed between Doi Kham and Fiber Pattana that results in a collaborative CSR project.

The solution we have found most effective in addressing Doi Kham’s waste generation problem, and in augmenting Doi Kham’s CSR ambitions, is a partnership between Doi Kham and the beverage carton recycling company, Fiber Pattana. Doi Kham would donate its wasted juice cartons to Fiber Pattana, and in turn, Fiber Pattana would repurpose them into green building materials and donate the products to those in need or sell them at reasonable prices in the Chiang Rai province. Fiber Pattana needs more beverage cartons and Doi Kham aims to mitigate the effects of its waste production. This partnership would be mutually beneficial to both companies’ CSR goals.

We recommend a small portion of the wasted beverage cartons be repurposed into upcycled goods such as baskets.

We recommend a microenterprise, where wasted juice cartons are repurposed into upcycled goods, such as baskets, to support the relationship between Doi Kham and the local community. Doi Kham would buy the baskets from the local residents, which would provide an added income for the local residents. The baskets would be sold for special occasions at the Doi Kham store.

We recommend Doi Kham send a small fraction of their wasted juice cartons to local schools in the Pa Sang district.

We recommend that Doi Kham send some of their wasted juice cartons to the local schools in Pa Sang to be used as planters or art supplies. This would not only help educate children on how to repurpose waste and develop their creativity skills, but it would also fulfill Doi Kham’s CSR goal. If this project is successful, we recommend that Doi Kham’s wasted juice cartons be sent to other schools in Chiang Rai as well.

Conclusion

With these recommendations, we hope that Doi Kham is able to mitigate the effects of the waste generated in their packaging processes, while strengthening its relationship with the Pa Sang community.
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Chapter One: Introduction

Two trillion pounds of waste are currently added to the planet each year, and this amount is expected to increase steadily (Hoornweg & Bhada-Tata, 2012). Failures to manage waste responsibly are causing environmental and public health problems all over the world. Increased availabilities and dependencies on packaged food products, as a result of expanding consumerism, has significantly contributed to the rise in waste generation.

Most packaged food products are contained in aseptic packaging, which is meant to protect food from damage and extend the foods’ shelf life. Juice carton aseptic packaging is composed of layers of paperboard, polyethylene, and aluminum foil, thus making it difficult and expensive to recycle. Efforts to recycle aseptic packaging are expanding, but can be unsustainable in areas where there is little incentive to front the extra cost for recycled goods. In Thailand, 88% of people choose to buy cheaper products, contained in non-recycled packaging, rather than buying those in recycled packaging (TCDC, 2009).

Thailand is experiencing a rapid rise in consumption of packaged food products, thus aseptic food packaging is becoming more prevalent in waste generation (Packaged food in Thailand. 2016). The environmental and public health challenges of packaged food waste are pertinent to our project sponsor, Doi Kham Food Products Co. Ltd. (Doi Kham), one of the largest and most well-known fruit and juice producers in Thailand. Currently, they are facing a waste management problem at their juice factory located in the Pa Sang community of the Mae Chan district in the Chiang Rai province. The factory currently produces over 3,000 wasted juice cartons every day as a byproduct of their manufacturing process, and there is no local treatment or recycling facility.

The goal of this project was to develop the most effective and feasible plan for repurposing Doi Kham’s wasted juice cartons in order to benefit the Pa Sang community. We planned and completed five objectives to achieve this goal. Our objectives aimed to determine the nature of the waste and the expectations of the community and company. With this information, we brainstormed possible solutions for treating the wasted juice cartons. We interviewed and gauged the Chiang Rai residents’ willingness to participate in proposed programs before we developed and proposed a suitable plan to Doi Kham.

This report contains a background chapter that explains global waste problems, reuse and repurposing programs, industry-community relations, and a brief history of Doi Kham. The methodology chapter includes our project’s goal, objectives, and steps carried out to complete our project. Our findings and results chapter explains our site visits, and interviews with the community members and Doi Kham employees. Finally, in our recommendations chapter, we detail a partnership between Doi Kham and a recycling company, a microenterprise plan, and an educational recycling program.
Chapter Two: Background

In order to sustainably provide all the resources the world population uses, and to absorb all the waste it generates, we currently need 1.5 Earths (Ewing et al., 2010). Given that we only have one Earth at our disposal, we must find more efficient methods of waste management, and minimize the amount of waste being produced. In this chapter, we explain waste problems globally and specifically in Thailand. We then outline the methods and obstacles to reducing waste. The chapter concludes with a description of Corporate Social Responsibility (CSR) and how it applies to companies such as our sponsor, Doi Kham Food Products Co. Ltd.

2.1 Solid Waste Problems

Over the past few decades, the global spread of consumer-based lifestyles has led to a demand for further industrialization. Because solid waste is mostly a byproduct of consumer goods, rising world populations and consumption per capita have resulted in overwhelming increases in waste generation. This is especially true for developing countries in Southeast Asia (Chiemchaisri, Juanga, & Visvanathan, 2007). According to the Thailand Pollution Control Department (PCD), Thailand increased municipal waste production from approximately 14 million tons in 2003 to approximately 27 million tons in 2013 (Thai Publica, 2014).

Waste management failures are causing environmental and public health problems. When waste decomposes in landfills, carbon is released as methane and other volatile compounds known as biogas (Gersberg, 2010). In Thailand, methane emissions are predicted to rise from approximately 127,000 tons per year in 2004, to 374,000 tons per year by 2020 (Chiemchaisri et al., 2007). This is significantly concerning because methane is up to 20 times more potent than carbon dioxide as a greenhouse gas (Zhang, Tan, & Gersberg, 2010). Additionally, when landfills lack adequate ground protection, they allow toxins to leach into groundwater, which affects the quality of drinking water (Euller & Petersen, 2014). In 2004, there were over three times as many open dumps as landfills in Thailand (Chiemchaisri et al., 2007). Open dumps, unlike most landfills, lack proper management and regulation, and thus pose greater health, safety, and environmental threats (Idris, Inanc, & Hassan, 2004). In order to protect the public health of its citizens, Thailand’s waste management policies are in need of alternative waste disposal solutions.

2.2 Waste Reduction

2.2.1 Obstacles to Waste Reduction

The most obvious method for reducing waste generation would be decreasing the consumption of goods, but in cases of developing countries this would entail reductions in economic activity (Ngoc & Schnitzer, 2009). In fact, cultures in developing countries are becoming more consumeristic because prices of consumer goods are falling due to streamlined industrial processes (World Bank, 2007). For example, “both the growth of economic development and the population, which increased sharply from 48 million (people) in 1982 to 65 million (people) in 2006, have resulted in the increase of municipal solid waste generation in...
Thailand” (Chiemchaisri et al., 2007, pg. 14). Developing countries like Thailand often lack the necessary economic viability, legislation, technical knowledge, and willingness for implementing proper waste management services (Guerrero, Maas, & Hogland, 2013).

2.2.2 Lack of Recycling and Repurposing in Thailand

Now, and even more so looking forward, focus on waste generation and management needs to become an integral part of developing infrastructures. Sustainable methods of municipal solid waste management (MSWM) are recycling and repurposing. Recycling may take place in formal and informal ways. Formal recycling requires large-scale infrastructure, where waste is separated by material composition or reprocessed, and then reconstituted into new products (Rodríguez-Gómez et al., 2015). Informal recycling methods are small-scale, labor-intensive, unregulated services that serve as alternatives to more expensive formal recycling practices (Wilson, Velis, & Cheeseman, 2006).

Due to lack of infrastructure for MSWM, there is a clear distinction between the recycling rates of developing and developed countries. Approximately 11 percent of waste in Thailand is recycled (Zhang, Tan, & Gersberg, 2010), whereas in Germany, 65 percent of waste is recycled (McCarthy, 2016). This difference is clearly evident in Chiang Rai, Thailand, where there are no formal recycling facilities (Eaktanatch Tethunyawarakul, personal communication, Jan 12, 2017). The lack of recycling and reuse options in the Mae Chan district of Chiang Rai are further compounded due to increased amounts of wasted aseptic beverage containers from local manufacturing processes. An example of wasted aseptic beverage containers accumulating at a local facility in Mae Chan can be seen in Figure 1 below.

![Figure 1: Trash Pile at Charoen Phol in Mae Chan, Chiang Rai](image-url)
The most abundant distributor of aseptic beverage containers is Tetra Pak. In 2015, 184 billion Tetra Pak containers were sold in over 170 countries (Tetra pak facts & figures. 2016). Tetra Pak containers are designed to have multiple layers consisting of aluminum, polyethylene, and paperboard in order to store liquids for long periods of time without deteriorating. This makes them very resistant to decomposition within landfills. Furthermore, the three different layers of the containers make them especially difficult to recycle, because they must be separated into each component and recycled separately. As more Tetra Pak containers are produced, the available space to dispose of them is becoming increasingly limited.

Efforts have been made to mitigate the environmental impacts of wasted Tetra Pak containers by repurposing them into creative, value-added, community-appropriate products. For example, in the community of San Mateo Rizal in the Philippines, a cooperative of women and school children are collecting waste juice cartons to turn them into a wide range of value-added products (Lapeña, 2013). One product they are making is a ‘tetra pot,’ a gardening pot made out of previously wasted Tetra Pak containers. The ‘tetra pots’ have successfully increased urban gardening in the areas where they are sold, allowing the practices of urban residents to become more sustainable. Reuse programs, such as this cooperative, are sustainably driving innovation and economic growth in developing countries, while reducing the global waste problem and supporting community development.

2.3 Corporate Social Responsibility (CSR)

Most companies, regardless of their industry, fundamentally depend on the communities in which they operate (Panwar, Nybakk, Hansen, & Pinkse, 2016). Residents from the surrounding areas, in addition to their role as customers, often make up the majority of a company’s workforce and supply chain (Uddin, Tarique, & Hassan, 2008). Because businesses cannot survive without these customers, employees, and suppliers, companies must holistically consider their communities as foremost stakeholders in all of their actions.

From the other end of this relationship, when a company is a major local employer, its presence and performance is often tantamount to the economic stability of its community (Uddin et al., 2008, p. 200). Steady employee salaries fuel local trade and service industries, suppliers are able to produce knowing their futures are secure, and local governments can put trust behind their planning of infrastructure developments (Littlewood, 2014). In successful scenarios, relationships between industries and their communities are both mutually dependent and mutually beneficial. However, achieving and retaining these relationships is no simple process.

Economic growth and industrialization have led to the presence of greater corporate activity in developing countries (World Bank, 2007, p. 1). The presence of more factories and businesses provides certain benefits to surrounding communities, such as new job opportunities. However, corporate activity is almost always directly followed by negative effects on the surrounding environment related to overuse of natural, non-renewable resources of energy, pollution, degeneration of biodiversity, climate change, and deforestation, among others (Uddin et al., 2008). Pollution and waste from industry remain prevalent hazards to the wellbeing of community members.
Although residents of most developing areas actively seek opportunities for economic growth, they have particularly deep cultural and environmental values, which should not be overlooked (Idemudia, 2007; Tang-Lee, 2016). Over time, companies have realized the need to mitigate their negative impacts, which has led to the rise of the concept of Corporate Social Responsibility (CSR). CSR focuses on ideals and strategies that companies take to make positive impacts on the environment and their stakeholders, including consumers, employees, and communities (Robertson, 2009). Ultimately, CSR strategies are tailored to the relevant cultural, social, political, and economic factors of their specific location, and are thus subject to cultural adaptation (Robertson, 2009). Through their CSR strategies, companies define their role and perception within the surrounding community.

Doi Kham Food Products in the Chiang Rai Province of Thailand is a clear example of the importance and success of CSR. In 1970, his majesty King Bhumibhol Adulyadej visited Chiang Rai and encountered the problem of opium poppy farming. He suggested a royal project initiative for local farmers to plant vegetables and fruits instead of opium poppies. Since the agricultural region of Mae Chan is far from the capital, his majesty the King established the Doi Kham factory to buy agricultural products from local farmers. This royal project follows his majesty’s philosophy of a ‘sufficiency economy’, which is based on the Thai principles of moderation, reasonableness, and risk management. His majesty the King believed that modern development, which focused only on industrial growth, would eventually lead the country into crisis (The Chaipattana Foundation, 2016). As a result, his majesty’s philosophy advocates for rural citizens to become self-sufficient in order to ensure the stability of the basic economy before focusing on the expansion of the industrial sector (The Chaipattana Foundation, 2016).

Today, Doi Kham has expanded out of the Royal Project Foundation, but the company still honors his majesty the King’s philosophy in their CSR strategies. Doi Kham’s value on community relations and their surrounding environment has driven them to find solutions to their waste generation problem. For this reason, Doi Kham asked us to develop feasible options for repurposing their wasted juice cartons in a way that directly benefits the surrounding Pa Sang community. The steps that we completed to achieve the goal of this project are outlined in the following methodology chapter.
Chapter Three: Methodology

3.1 Project Goal

The goal of our project was to develop the most effective and feasible plan for repurposing Doi Kham Food Products’ waste juice cartons in order to benefit the Pa Sang community. We outlined five objectives to reach this goal.

3.2 Objectives

1. Explore the manufacturing process of making the juice cartons and the nature of the waste generation problem.
2. Identify and Understand Doi Kham’s expectations and the Pa Sang residents’ needs.
3. Determine possible techniques for recycling or reusing waste juice cartons
4. Evaluate the feasibility and impacts of the chosen programs.
5. Develop plans for the best reuse techniques that are both viable and beneficial for Doi Kham and the Pa Sang community.

Objective 1:

Explore the manufacturing process of making the juice cartons and the nature of the waste generation problem.

In order to propose the best solution possible for Doi Kham’s waste generation, we investigated why the problem exists in the first place. The team explored the manufacturing process behind the production of Doi Kham juice cartons by visiting the company’s factory in Mae Chan, Chiang Rai. During our tour of the factory with the plant manager, we witnessed the locations where the waste was being produced, and we further understood how much, and how often, waste was being generated. At the end of our tour we obtained a table of official waste production statistics for the factory. With the information from this tour, and with the official production statistics, we were able to understand the magnitude of the waste production problem that our solutions needed to address. By exploring the manufacturing process we were able to understand what the sources of waste are, why they happen, and that they cannot be avoided. With these pieces of information, we were able to determine the scope of our project, which then led us to focus our efforts on reuse and recycling programs rather than on improving manufacturing efficiencies.

Objective 2:

Identify and Understand Doi Kham’s expectations and the Pa Sang residents’ needs.

To understand how Doi Kham’s waste generation problem was affecting the Pa Sang community in Mae Chan, the team visited Charoen Phol, a waste facility located less than a mile from Doi Kham’s Chiang Rai factory, and interviewed the owner, Mrs. Nitinart Tethunyawarakul, who explained how the waste was being stored and the obstacles she faces in trying to sell Doi Kham’s waste to other recyclers (Appendix A). The team also interviewed the secretary of a local elementary school, Baan Pa Sang, Mrs. Jiraphorn Muangsook, in order to
understand what role the environment plays in the school’s curriculum (Appendix B). The team gave a presentation about reuse and led a student activity to decorate wasted Doi Kham juice cartons to learn how the students viewed reuse and recycling practices. The team also interviewed the assistant to the mayor of the Pa Sang community in order to better understand the community, and to learn of any future recycling or reuse plans for the district that may have the potential to tie into our project with Doi Kham (Appendix C). To understand Doi Kham’s expectations for our project, the team held a presentation for Doi Kham employees at the Chiang Rai factory. At the end of this presentation there was a discussion regarding Doi Kham’s current waste generation, their relationship with the Pa Sang community, and their hopes for the future of the company and our project. Ultimately, these interviews were instrumental in making sure that our proposed programs were specifically tailored to the situations of Pa Sang residents, and were vital in making sure that our ideas were aligned with those of Doi Kham.

**Objective 3:**

*Determine possible techniques for recycling or reusing waste juice cartons.*

In order to begin the process of determining which techniques for recycling or reusing Tetra Pak juice cartons were most suitable for Doi Kham and the Pa Sang community, the team conducted extensive background research that considered as many solutions as possible. In addition to a diverse literature review, the team contacted various companies and organizations of reuse and repurpose programs already in place. We contacted Fiber Pattana, a company that makes roofing from recycled beverage containers, and arranged an interview. By phone, we spoke with the CSR officer of Ampol Food, a company that makes school desks and chairs from recycled beverage cartons, and sent them information about our project to determine whether they could accept Doi Kham’s wasted juice cartons. We interviewed Phillip Baker, the founder of a South American pepper production company, to get his input on the feasibility of using beverage cartons as planters in contracted farming processes (Appendix D). We also interviewed Ciudad Saludable, a Peruvian NGO focused on community solid waste recycling, to understand its recycling programs and to assess the possibility of incorporating a similar system into the Pa Sang community (Appendix E). The literature review and communications conducted for this objective gave us a broad understanding of techniques and program structures to analyze and consider.

**Objective 4:**

*Evaluate the feasibility and impacts of the chosen programs.*

In order to weigh the pros and cons of each reuse method inventoried in objective three, the team constructed feasibility and impact tables (Appendix F and G). In these tables we have listed the environmental, social, and economic pros and cons of each reuse method as they pertain to the needs, priorities, and cultural values of Pa Sang community members. The team also listed the economic, infrastructural, and regulatory pros and cons of each method, as they relate to the capabilities and constraints of Doi Kham and the Pa Sang community. To fill out these tables, we conducted research on similar programs and methods that had been carried out
in Thailand and around the world. We researched companies that had recycling programs in order to learn from their strengths and weaknesses. We also used information learned from our interviews with Pa Sang residents, as well as observations from the children's activities we conducted. With this table completed, we qualitatively assessed the feasibilities and impacts of each method, specific to Doi Kham’s and Pa Sang’s scenario. We evaluated each method by estimating the amount of wasted juice cartons needed, the capital cost required, the number of people needed to maintain the program, the likelihood of success of the project, and the impact it would have on the community. We were then able to compare the methods to one another in order to narrow our focus to only those that were viable and beneficial.

Objective 5:

*Develop plans for the best reuse techniques that are both viable and beneficial for Doi Kham and the Pa Sang community.*

With the analysis of our feasibility and impact table, which combined our findings from objectives one, two, and three, we had enough information to make an informed decision as to which re-use techniques were both feasible for Doi Kham and beneficial to the Pa Sang community. We then compiled these options and presented them to Doi Kham and other involved stakeholders, accompanied with explanations of the data, criteria, and reasoning behind our decisions. To supplement this presentation, we constructed plans that detailed how Doi Kham and involved stakeholders would carry out such programs upon our departure.
Chapter Four: Findings & Results

In this chapter, we organize our research into three groups of findings: general information about Doi Kham and the Pa Sang, Mae Chan community, local small-scale solutions, and large-scale solutions. The findings are based on observations from our visits to Chiang Rai and interviews carried out with Doi Kham employees, Pa Sang community members, and recycling company representatives. Due to the time constraints of our visits to Chiang Rai, we were unable to interview local farmers, business owners, and as many schools as we would have liked. Therefore, there might be opportunities left unexplored; however, we believe our research is comprehensive enough to ensure that we propose feasible and appropriate solutions to Doi Kham’s waste problem.

4.1 Group 1: Doi Kham & the Pa Sang, Mae Chan Community

Finding 1:

*Due to their origin as a Royal Project initiative, CSR is essential to Doi Kham.*

Although Doi Kham has expanded out of the Royal Project Foundation, our team found that they still follow his Majesty King Bhumibol Adulyadej’s philosophy of ‘sufficiency economy’ and people-centered development through their CSR practices. Doi Kham’s CSR efforts are evident in their relationship with their suppliers. Doi Kham provides seeds and teaches their farmers how to grow them, then buys back the produce at fair prices. This way, Doi Kham still supports the Royal Project Foundation’s initiative to provide local farmers with an alternative to opium poppy farming, helping them become self-sufficient.

During our first visit, we also found that Doi Kham hosted a variety of events and activities that supported their suppliers and local community. Some of Doi Kham’s CSR representatives organized meetings and activities with different organizations including a local school, the mayor’s assistant, and community children, all of which demonstrate their close relationships with the residents of the Pa Sang community. Doi Kham also hosted a Children’s Day celebration open to all community children at their Chiang Rai factory in which we were able to organize repurposing activities. A photograph of the children doing craft activities during this event can be seen below in Figure 2. Doi Kham employees were even willing to wash and dry a pile of wasted juice cartons for us to use. This clearly showed that Doi Kham is willing to allocate time and resources to community programs.
During our second visit, we learned that Doi Kham employees would be willing to lead and manage local upcycling programs for the wasted juice cartons. They supported the idea of involving community members in repurposing the waste to provide part-time jobs to local residents. They were also willing to buy back the upcycled goods and sell them at the factory store to ensure there would be a customer for the products. This shows that the company is invested in supporting local ventures even if they generate a time and economic burden for the company and do not solve the overall waste problem.

**Finding 2:**

*There are different sources and types of waste juice cartons being produced at Doi Kham’s Chiang Rai factory.*

After touring the manufacturing process and speaking with employees, the team determined that there were five locations where wasted juice cartons were produced, and that the types of wasted juice cartons produced varied at each location. Although we were unable to obtain the amounts of wasted juice cartons produced at each stage, in Table 1 we outline how waste is created at each of these stages of the manufacturing process. Figure 3 shows a flow diagram of the waste production process at Doi Kham’s Chiang Rai factory.
### Table 1: Sources of Waste at Doi Kham’s Chiang Rai Factory

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stage 1: Rolling Paper</strong></td>
<td>At the beginning of the manufacturing process, there are flat rolls of carton material laid out in front of the machines. Before it goes into the machine to be shaped into a box and filled, the outside layers of the rolls are removed and wasted to reduce the chance of contamination. The form of this waste is flat and does not have any juice in it.</td>
</tr>
<tr>
<td><strong>Stage 2: Dry Run</strong></td>
<td>The dry run process occurs when the machines are restarting. During this process, the machines shape the cartons but do not fill them with juice; these cartons are then discarded.</td>
</tr>
<tr>
<td><strong>Stage 3: Misshapen juice cartons</strong></td>
<td>After the cartons are filled, some cartons do not meet Doi Kham’s standards of shape or size, and thus the juice is drained for reuse and the cartons are discarded.</td>
</tr>
<tr>
<td><strong>Stage 4: Quality Control Station</strong></td>
<td>At this stage, the straws and caps are attached to the juice cartons. Straws are attached to the 200 mL sized cartons and caps are attached to the 1000 mL sized cartons. If the straws or caps do not correctly attach to the cartons, the juice is drained and the cartons are then discarded.</td>
</tr>
<tr>
<td><strong>Stage 5: Straw and Cap Station</strong></td>
<td>At the end of the manufacturing process, every 45 minutes, a 200 mL juice carton is taken from the production line to do a quality check. This process is repeated every 30 minutes for the 1000 mL containers.</td>
</tr>
</tbody>
</table>

**Figure 3: Doi Kham Waste Production Flowchart**
Due to the variety of waste being produced, not all of it can be repurposed in the same way. When we conducted the children’s repurposing activities at Pa Sang Elementary School and Doi Kham’s Children’s Day celebration, we found out that the 1L cartons work best to make planters and the 200 mL juice cartons work best to make crafts such as coasters. In order to repurpose as much waste as possible, several repurposing options that suit the different types of waste produced at the Doi Kham factory are needed.

**Finding 3:**

*Reducing or changing the amount and type of waste produced is not feasible.*

The team has concluded that it is not within the scope of this project to change the manufacturing process to produce less waste. After touring the plant and speaking to employees about the manufacturing process, it was clear that the system that Doi Kham uses is efficient. The Tetra Pak machines are already designed to maximize efficiency and minimize waste. Each month, Doi Kham sends nine million juice cartons to shelves and produces around 100,000 wasted juice containers. This ratio is respectable at approximately 99-percent production efficiency.

Much of the waste that is made at Doi Kham is created when the machines switch to produce a new type of juice or use a new roll of carton material. When the machines start these new processes, they have to go through a dry run process that wastes many containers. While reducing the number of times the type of juice is changed could lessen the amount of waste being produced, the decision to switch juice production is based on the supply and demand of the juices, as well as the needs of their employees to make their overall system most efficient. Therefore, changing the operational practices of Doi Kham is not a reasonable solution to this problem.

Furthermore, changing the containers to biodegradable cartons is not currently a feasible option for Doi Kham. Doi Kham has invested in the infrastructure that produces the current cartons, so switching to new machinery would not be worth the capital cost. Also, with the lack of structured waste and recycling processes in Mae Chan it is not guaranteed that the biodegradable cartons would be able to decompose in the appropriate environment and thus could continue to build up in a similar manner.

**Finding 4:**

*Due to the large quantity of waste being produced, a large-scale solution is needed to manage the waste sustainably.*

The team acquired Doi Kham’s waste production data for five months (Appendix H). The data for the month of January, 2017, which represent the statistics for a typical month, are shown in Table 2. Approximately 100,000 cartons are wasted each month. The large quantities of discarded juice cartons dictate that a large-scale recycling solution, which would manage all of the waste being produced for an extended period of time, is necessary for solving Doi Kham’s waste problem. Small-scale repurposing solutions, which use some of the wasted juice cartons, can benefit the local community by potentially providing an alternative income and teaching
future generations about reuse. However, these types of solutions do not solve Doi Kham’s waste problem because they would account for less than 1% of the waste production.

<table>
<thead>
<tr>
<th>Type of cartons</th>
<th>Production</th>
<th>Wasted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of the boxes</td>
<td>Percentage</td>
</tr>
<tr>
<td>200 ml. machine #1</td>
<td>1,047,900.00</td>
<td>13,192.00</td>
</tr>
<tr>
<td>200 ml. machine #2</td>
<td>1,052,140.00</td>
<td>14,112.00</td>
</tr>
<tr>
<td>200 ml. machine #3</td>
<td>5,166,668.00</td>
<td>30,476.00</td>
</tr>
<tr>
<td>Total of 200 ml.</td>
<td>7,266,708.00</td>
<td>57,780.00</td>
</tr>
<tr>
<td>500,1000 ml. machine#1</td>
<td>1,225,764.00</td>
<td>31,994.00</td>
</tr>
</tbody>
</table>

4.2 Group 2: Small-Scale Repurposing Solutions

Qualitative analysis of proposed small-scale repurposing solutions can be found in Appendix F.

Finding 5:

*Doi Kham and Pa Sang, Mae Chan community members are interested in community-orientated repurposing solutions of the wasted juice cartons.*

During our first visit to the Doi Kham factory in Chiang Rai, Doi Kham’s plant manager, Mr. Napol Muenkiang (P’Napol), suggested that the waste juice cartons be used to make baskets to give to customers as a gift when they buy Doi Kham’s products at a certain price, or sold as a present for special occasions. These upcycled baskets would not necessarily serve to increase the company's profit, but to promote their marketing campaigns and strengthen their relationship with the community.

During our meeting with the mayor of the Pa Sang district, Mr. Preecha Kumboonrong, we learned that he supported the idea of making baskets from Doi Kham’s wasted juice cartons. He believed the repurposing program could serve as a good part-time job for Pa Sang residents but would not be viable as a full-time job because it would not be economically feasible to pay people minimum wage (300 baht per day) to make the baskets. He also mentioned similar programs had been initiated in the past, but had all failed due to a lack of financial support and proper management.
After our meeting with the mayor, we learned that Thanapon Sitti (P’Pram), a community relationship officer for Doi Kham, would be willing to take on the responsibility of managing the basket program to ensure its success. This shows that although Doi Kham understands that a long-term, large-scale solution is required to process the volumes of waste they currently produce, they still encourage short-term repurposing solutions that can benefit local residents and customers.

**Finding 6:**

*Schools are excited to incorporate reuse programs in their curriculum.*

On our first trip to Chiang Rai, the team visited Pa Sang Elementary School, a school with 200 students, and met with Jiraphorn Muangsuk, the secretary of the school. She explained how their school incorporates reuse programs into their curriculum. We found that kindergarten students use water bottles as planters as seen in Figure 4. One possibility is replacing the water bottles with juice containers.

![Water bottle planters created by kindergarten students in Pa Sang Elementary School](image_url)

**Figure 4: Water bottle planters created by kindergarten students in Pa Sang Elementary School**

This school was selected as the STEM Education role model in the district. This program is an initiative of Her Royal Highness Princess Maha Chakri Sirindhorn, aimed to encourage students to use their critical thinking skills (Jiraphorn Muangsuk, personal communication, Jan 13, 2017). Jiraphorn also suggested creating an herb garden and starting a planting skills program with the juice containers. After the interview, the team prepared for a Children’s Day activity with over 100 students. We conducted painting activities and learned that they gained students’ interests, but did not create value-added, sellable products. The crafts that were made during the painting activities are shown below in Figure 5.
The following day, as a part of Doi Kham’s Children’s Day celebration, we conducted juice carton repurposing activities with better outcomes. We led coaster-weaving and planter-making activities that also interested children, and the results were put to practical use.

From our findings, we learned that two schools in the Chiang Rai area are interested in incorporating juice cartons into their current curriculum because it builds students’ creativity and critical thinking skills, while teaching them about sustainability (Jiraphorn Muangsuk, personal communication, Jan 13, 2017). Baan Huay Euen Elementary school in Chiang Rai is working on their organic gardening program, and the teachers are interested in using the juice cartons as planters. However, this school is located far away from Doi Kham, which makes transportation difficult.

**Finding 7: There is not a viable market for reused juice carton craft products in Mae Chan.**

On the first day of meeting Doi Kham’s employees, we met with Lalipat Phakeaw (P’Nat), a worker in the environment department. She informed us that she created hats to sell in the Chiang Rai market, as shown in Figure 6. At first, she was selling many hats, but sales dropped rapidly. Also, wages were not enough compared to the amount of time spent on creating the hats. Another option we considered is selling children’s juice carton crafts, but the quality of children’s crafts did not meet retail standards as we learned from conducting children’s activities at Baan Pa Sang Elementary School. With a lack of people creating quality upcycled products and selling them, there will ultimately be a lack of interest in a market of upcycled juice carton goods (P’Nat, Personal Communication, January 13, 2017). Similar initiatives have been carried
out in the Pa Sang district but all have failed due to lack of leadership and monetary investment (Somchit Jaintah, Personal Communication, February 7, 2017).

![Image](image1.png)

**Figure 6: Upcycled hat made from wasted Doi Kham juice cartons by Doi Kham employees**

**Finding 8:**

*Juice cartons can be reused as planters, but they are not feasible for industrial farming.*

The materials that compose the juice cartons, aluminum, paperboard, and polyethylene, make the wasted beverage containers a good option for garden planters. A test done by the team to grow kale from seeds in a wasted Doi Kham juice carton was successful in Bangkok, as evidenced in Figures 7 and 8.

While wasted beverage carton planters have been successful on a small scale, using them for large-scale farming has not been supported. Phillip Baker, a pepper producer in South America, suggested that using juice cartons would be inefficient for his farmers (Phillip Baker, personal communication, Jan 25, 2017). According to Baker, the cartons would only function for one cycle of transplants, and would only prove useful if they were to decompose as the plants grow. He also stated that there are other more suitable and sustainable options readily available like egg-cartons. In Chiang Rai, Doi Kham did not think that using juice cartons would be successful for their farmers because the farmers already have other efficient farming practices they use for transplanting, and the transportation costs for the wasted cartons would be high (P’Napol, personal communication, Jan 12, 2017).
4.3 Group 3: Large-Scale Recycling Solutions

Qualitative analysis of proposed large-scale recycling solutions can be found in Appendix G.

Finding 9:

*Currently there is no infrastructure to recycle in Chiang Rai, but there is interest in creating recycling programs.*

Currently Doi Kham ships their wasted juice cartons to Charoen Phol, a local waste storage facility approximately 1.5 km away from the factory, because there are no recycling plants in the province. Doi Kham is paying for the transportation costs and giving the cartons away for free because Charoen Phol reported that they could no longer afford to buy all of the waste. Doi Kham tried sending the waste to the local government to be burned, but the practice produced large amounts of greenhouse gases, and Doi Kham and the government stopped supporting it. Furthermore, the government has begun to encourage residents to separate their waste and recyclables. However, the waste gets combined once again at the waste facility, and disposed of jointly. This shows that the government and residents are willing and excited to welcome recycling in the region, but that the lack of infrastructure is delaying the process.

After explaining Doi Kham’s waste generation problem to David Berón Echevarría, a former Watson Scholar who focuses on the politics and economics of waste management, he suggested that there is sufficient waste being produced at the Doi Kham factory to open a microenterprise recycling facility in Chiang Rai. The reason is because separating the paper from the polyethylene and aluminum of juice cartons is a relatively simple process, and a significant revenue can come from selling the paper pulp. Therefore, the return on investment from the recycled materials would justify the capital cost of the recycling facility. We also found that microenterprises of this sort have been started by the non-profit Ciudad Saludable and have been successful in Peru and other countries in South America (Eduardo De La Torre Jave, personal communication, Jan 25, 2017). Eduardo De La Torre Jave, a project coordinator at Ciudad Saludable, was willing to assist Doi Kham in forming this microenterprise, and he believed that the model used in South America could have a similar positive impact in Chiang Rai.
Finding 10:

There are organizations in Thailand that promote recycling and meet their Corporate Social Responsibility goals by making building materials from wasted beverage cartons.

As a part of our research, we sought to connect with already established organizations, in or around Thailand, that recycle wasted beverage cartons. We found that the most prevalent efforts were in recycling the polyethylene and aluminum from the wasted cartons into building materials and furniture. The organizations we found, and reached out to, are the Amphol Food Group, the Thailand Creative Design Center (TCDC), Green Board Thailand, and Fiber Pattana, along with Tetra Pak Global and initiatives of theirs in Malaysia, and Hong Kong. All of these companies use the same general procedures for recycling wasted beverage cartons, and would all be able to utilize Doi Kham’s wasted cartons from Chiang Rai. However, the company we were able to connect with most closely was Fiber Pattana.

Fiber Pattana is a Bangkok-based company that collects wasted beverage cartons from beverage companies, third-party waste facilities, and collection bins at department stores. They separate the paper pulp from the aluminum and polyethylene of the beverage cartons and recycle these materials into three main products. The aluminum and polyethylene are heated and molded into ‘Green Roof’ and ‘Eco-Board’ products, which are fire retardant, insulating, shock absorbent, flexible, reflective to ultraviolet rays, and have a long lifespan. The paper pulp is used in their ‘Eco-Paper’ product, or sold to the Siam Cement Group (SCG) to be made into cardboard packaging.

After visiting the Charoen Phol facility in Mae Chan, Chiang Rai, and after speaking with the facility’s owner, Mrs. Nitinart Tethunyawarakul, we discovered that until 2015 she had been selling the waste to Fiber Pattana. Doi Kham would transport the cartons daily from their factory by small truck to Charoen Phol. Mrs. Nitinart Tethunyawarakul would receive the cartons, compress them into 700 kg cubes, and sell them to Fiber Pattana. The compressed waste at Charoen Phol is shown in Figure 9. This relationship ended, Fiber Pattana reported to us, when they noticed that third-party waste collectors began adding hidden weigh like rocks to the compressed cubes, which damaged Fiber Pattana’s equipment. This led Fiber Pattana to source their supply of wasted cartons directly from beverage company factories in Thailand. However, the amount of wasted cartons they are currently collecting in Thailand does not meet their production demands. As a result, Fiber Pattana is importing around 50% of their supply from other countries, including those as far as Canada and Japan.
After learning of the former relationship between Fiber Pattana and Chareon Phol, the team contacted and met with Fiber Pattana’s marketing manager, Khun Saichon. At the meeting, we learned that Fiber Pattana has made it their goal to increase production by 20 percent in 2017. To do this, they plan on expanding their reach to directly collect from more beverage companies, in more provinces of Thailand. We also discovered that the company splits their operations into separate for-profit and not-for-profit accounts. In their for-profit accounts, wasted cartons are purchased by Fiber Pattana, and are recycled into products that they intend to sell for a profit. In their not-for-profit accounts, the aluminum and polyethylene from donated wasted cartons are recycled into products that Fiber Pattana donates back to victims of natural disasters. The paper pulp byproduct from these donations, and the ensuing sales from Fiber Pattana’s ‘Eco-Paper’ products, allow the company’s not-for-profit account to be economically feasible. After our discussions, Khun Saichon expressed that Fiber Pattana would be very interested in exploring a direct partnership with Doi Kham.
Chapter Five: Recommendations

The focus of this project was to reduce Doi Kham’s waste problem while maintaining its strong relationship with the Mae Chan community. From our findings, our team has determined a set of recommendations that will strengthen Doi Kham’s Corporate Social Responsibility (CSR) strategies and follow his majesty King Bhumibol Adulyadej’s philosophy. We have divided our recommendations into two groups: large-scale recycling recommendations and small-scale repurposing recommendations. This chapter begins by discussing our large-scale recycling recommendations, which would eliminate all of Doi Kham’s waste. Then we present our small-scale repurposing recommendations, which focus on local CSR aspects of the project. The chapter will also detail some of the limitations to implementing these recommendations.

5.1 Group 1: Large-Scale Recycling Recommendations

After our visits to Doi Kham’s factory, we determined that a large-scale recycling solution is the best option for the company’s waste problem due to the high volume and variety of waste. After evaluating the large-scale recycling options available, and contacting different recycling companies in Bangkok, we determined the most expedient and effective option for Doi Kham would be to form a partnership with the recycling company Fiber Pattana. This partnership would allow Doi Kham to manage all of their waste, to fulfill their CSR goals, and potentially to lead to widespread beverage carton recycling in the Mae Chan, Chiang Rai area.

Recommendation 1:

*We recommend an agreement and partnership to be formed between Doi Kham and Fiber Pattana that results in a collaborative CSR project.*

Our first and foremost recommendation is a collaborative Corporate Social Responsibility (CSR) project between Doi Kham and the beverage carton recycling company Fiber Pattana. From finding 10, we know that Fiber Pattana is looking to expand their production by 20 percent by 2017, and are in need of local raw materials for their manufacturing process because they are currently importing 50 percent of the wasted beverage cartons they use. From finding 4, we know that Doi Kham consistently produces approximately 100,000 waste juice cartons per month. We know the waste is an economic burden to the company because, as determined in finding 9, the company has to ship the waste to Charoen Phol for free due to lack of better alternatives in the area. For these reasons, we recommend that Doi Kham donate their wasted juice cartons to Fiber Pattana to be made into ‘Eco-Board’ and ‘Greenroof’ products. In turn, we recommend that Fiber Pattana send the equivalent amount of ‘Eco-Board’ and ‘Greenroof’ products back to the Mae Chan community to benefit local residents. This project would effectively eliminate all of Doi Kham’s waste, and would reduce Fiber Pattana’s raw material importation costs. Additionally, the project would support both companies’ CSR goals. An agreement that follows the three steps below would be ideal:
1) Doi Kham donates its approximately 100,000 monthly wasted beverage containers from its Chiang Rai packaging factory to be recycled by Fiber Pattana in Bangkok. Transportation costs could be covered in two ways:
   a) **Option A:** Fiber Pattana could pay the transportation fees to pick up the wasted cartons, and Doi Kham would donate the cartons for free
   b) **Option B:** Doi Kham could pay for the transportation costs and in return Fiber Pattana would buy the cartons from Doi Kham

2) Fiber Pattana uses the aluminum and polyethylene from the donated cartons to make their Green Roof and Eco-Board products, while funneling the paper byproduct of the process into their Eco-Paper product in order to offset costs

3) Doi Kham and/or Fiber Pattana transports some of the Green Roof and/or Eco-Board products back to the Chiang Rai community
   a) **Option A:** Donate ‘Eco-Board’ furniture to local schools
   b) **Option B:** Donate ‘Green Roofs’ to residents in need
   c) **Option C:** Sell ‘Green Roof’ and ‘Eco-Board’ materials to residents at fair prices
   d) **Option D:** Make an agreement to build storage facilities from ‘Green Roof’ and ‘Eco-Board’ material for Doi Kham’s suppliers to store and better preserve their produce

**Recommendation 2:**

*We recommend that Doi Kham should acquire a compressing machine to bypass the need for a middleman.*

We determined in Finding 11 that Fiber Pattana has stopped buying the wasted beverage cartons from middlemen due to the mishandling of waste. However, the middleman provided an important service of compressing the beverage cartons for Doi Kham, which made transportation and storage of the waste more efficient and affordable. During the meeting between Fiber Pattana and Doi Kham on the second trip the two parties discussed the benefits that a compressing machine at the Doi Kham Factory would provide to both companies. Therefore, we recommend that Doi Kham either invests in a compressing machine themselves, or negotiates a purchasing plan with Fiber Pattana to acquire a compressing machine for the factory. The team looked into the capital investment required for a compressing machine, but found a wide range of prices and systems. For this reason, we further encourage that Doi Kham work with Fiber Pattana, as they have knowledge about this process. This acquisition would allow Doi Kham to compress the waste themselves, bypass the need for a middleman, directly handle their waste, and follow Fiber Pattana’s directions.
**Recommendation 3:**

*We recommend that Doi Kham should collect wasted beverage cartons throughout Mae Chan to send to Fiber Pattana.*

Fiber Pattana requires large quantities of wasted beverage cartons in order to make their Green Roof and Eco-Board products, and, as determined in finding 10, they are hoping to increase production by 20 percent in 2017, and decrease importation of wasted beverage cartons. From finding 9, we found that the community is interested in creating recycling programs. Currently, community members are separating their waste but there are no formal recycling centers in the region. We recommend that Doi Kham start an educational campaign around the community that teaches people about the importance of recycling, encourages them to gather wasted beverage cartons, and sell or give them to the Doi Kham factory. We recommend local schools to be the primary collection areas because it is relatively easy for students to bring in their family’s used beverage containers, and, from finding 6, we know local schools are interested and willing to incorporate reuse programs in their curriculum. Doi Kham would then collect the waste cartons from the schools and send them to Fiber Pattana to be recycled along with their waste. The non-profit Ciudad Saludable has been successful starting community wide recycling programs and has offered to help Doi Kham and the Mae Chan community. Therefore, we recommend that Doi Kham reaches out to Ciudad Saludable.

By creating this waste collection system, Doi Kham could not only become the first collection center for wasted beverage cartons in Mae Chan, but could also build their relationship with the Pa Sang community. Having the community participate in the recycling of wasted beverage cartons would provide them with a better sense of involvement in the program, and would thus further encourage recycling programs in the area. Additionally, if the residents were to donate their wasted cartons to Fiber Pattana, and then if Fiber Pattana were to donate their products back to the community, the program could become self-sustaining. If the project is successful, Doi Kham could use this project as a role model for other communities around Chiang Rai, and also for the communities around the other Doi Kham factories. The project could lead to large-scale recycling in the northern region.

### 5.2 Group 2: Small-Scale Repurposing Recommendations

While the partnership between Fiber Pattana and Doi Kham would be the most successful method for eliminating the magnitude of wasted beverage cartons produced by Doi Kham, one of Doi Kham’s main goals for this project was to strengthen community relations by directly involving the residents in a repurposing solution. Therefore, we have outlined recommendations that were specifically chosen because they offer an additional benefit to the local community, strengthen the relationship between Doi Kham and the community, and are feasible to implement and maintain. The proposed solutions focus on teaching the importance of recycling and sustainability, which could stimulate recycling programs throughout the province.
Recommendation 4:

We recommend a small portion of the wasted beverage cartons be repurposed into upcycled goods.

We determined in Finding 5 that the Doi Kham factory plant manager and community leaders supported the idea of community involvement by creating baskets out of the wasted juice cartons. Therefore, we recommend that community members build baskets as a part-time job, and Doi Kham buys back the baskets to make gift sets of products for special occasions. This way, Doi Kham would be supporting the local economy by providing participating community members with an alternative income. Additionally, the basket program would serve as a marketing campaign for Doi Kham. However, as mentioned in Finding 7, there may be challenges such as maintaining proper management, demand for the baskets, and lack of interest in creating them. For these reasons, we have drafted a micro-enterprise plan (Appendix I & J) that we believe could help Doi Kham start and manage the basket program successfully, as long as they find committed community members to participate in it. Ultimately, the basket program would raise awareness of reuse programs and would help build the relationship between Doi Kham and the Pa Sang community.

Recommendation 5:

We recommend that Doi Kham send a small fraction of their wasted juice cartons to local schools in the Pa Sang district for repurposing activities.

From findings 8 and 6, we know juice cartons work well as planters and can be easily turned into usable crafts by children. Therefore, as one of their CSR projects, we recommended that Doi Kham sends some of their wasted juice box containers to local schools to be used as planters or art supplies. Assuming that most of the local elementary schools have approximately 200 students, as determined in finding 6, Doi Kham could donate about 200 beverage cartons per semester to each local school in the Pa Sang district. This shouldn’t be a problem because, from finding 5, we know schools are willing to incorporate reuse programs in their curriculum since they teach children how to repurpose waste while developing their creativity skills. The clean, flat, rolled waste material, can be used for all types of school supplies for subjects ranging from art to science. If this project is successful, beverage cartons may be sent to other schools in Chiang Rai. In addition, if recommendation three is adopted, and the school becomes a collection point for wasted beverage cartons, then the school will have an ample amount of cartons and Doi Kham will not need to deliver them. Although sending cartons to schools will not solve the major waste problem in the Doi Kham factory, it helps teach future generations about the value and importance of repurposing and recycling waste.
Conclusion

The goal of our project was to develop the most effective and feasible plan for repurposing Doi Kham Food Products’ wasted juice cartons in order to benefit the Pa Sang community. Doi Kham produces approximately 100,000 wasted juice cartons from their manufacturing process each month. With no local recycling facilities, these wasted cartons are continuously piling up. Through our research, we found one large-scale recycling solution which we believe Doi Kham should utilize in addressing the entirety of their waste problem, and two small-scale repurposing programs that have the potential to strengthen their relationship with the local Pa Sang community.

As evident in the case of Doi Kham’s factory in Chiang Rai, waste is currently an unavoidable byproduct of manufacturing processes. With a lack of recycling infrastructure in developing countries, waste has become an imminent problem that can no longer go unattended. For this reason, it is imperative that companies, such as Doi Kham, address their waste generation and encourage their surrounding communities to do the same. With a more environmentally conscious and proactive world, it could be possible to turn the tide and significantly reduce waste accumulation problems.
References


Lapeña, C. (2013, Mar 8,). Trash into treasure: Women 'tetra pickers' lauded as recycling champions. *GMA News Online,*


Glossary of Technical Terms

**Large-Scale Solution:** A recommendation that requires a structured program that continuously uses the majority of Doi Kham’s wasted juice cartons and positively impacts many communities.

**Recycle:** The process that involves breaking down waste material into its components and converting it into new materials.

**Repurpose:** To use something again for a different purpose without breaking it into its constituent components.

**Reuse:** To use a product again, with or without reprocessing, for the same or different purposes.

**Small-scale solution:** A recommendation that involves using small quantities of wasted juice cartons and mainly focuses on local impacts.

**Sufficiency Economy:** A philosophy of His Majesty King Bhumibol Adulyadej based on the Thai principles of moderation, reasonableness, and risk management. “This is a method of development that stresses the distribution of income to build the overall economic foundation and stability of the country before going on to a higher level of development” (The Chaipattana Foundation, 2016).

**Upcycle:** Converting waste material into new products without breaking the compositions.
Appendix A: Interview Questions for Owner of Local Trash Facility in Chiang Rai.

Interview Preamble

“We are a group of university students. We are working on a project with Doi Kham Food Products in Bangkok and Chiang Rai, Thailand. We are conducting interviews to learn more about the needs and priorities related to the implementation of re-use programs in Chiang Rai. Our goal is to develop a plan for repurposing Doi Kham Food Products’ waste juice cartons in order to benefit the Chiang Rai community.

Your participation in this interview is completely voluntary and you may withdraw at any time. If you would like, we would be happy to include your comments as anonymous, although it would be useful for the context of our findings.”

Questions:

• What is/are your name(s) and how do you spell them?
• What did you use to do with the waste? Why did you stop doing that?
• Did you accept the waste both filled with juice and empty boxes from Doi Kham?
• Who did you transport the waste to? How did you transport the waste?
• Is your company the only one to accept the waste carton? If so, why?
• How does the waste impact the people who live near the factory?
• Where are all the waste facilities located in Chiang Rai province?
• May we exchange contact information?
Appendix B: Interview Questions for Secretary of a Local Elementary School, Baan Pa Sang.

Interview Preamble

“We are a group of university students. We are working on a project with Doi Kham Food Products in Bangkok and Chiang Rai, Thailand. We are conducting interviews to learn more about the needs and priorities related to the implementation of re-use programs in Chiang Rai. Our goal is to develop a plan for repurposing Doi Kham Food Products’ waste juice cartons in order to benefit the Chiang Rai community.

Your participation in this interview is completely voluntary and you may withdraw at any time. If you would like, we would be happy to include your comments as anonymous, although it would be useful for the context of our findings.”

Questions:

- What is/are your name(s) and how do you spell it?
- What do you teach and what grades do you teach?
- Do you teach about the environment and sustainability in your curriculum?
- What is your current relationship with Doi Kham?
- Does the waste from Doi Kham affect you?
- Would you be interested in using the tetra pak containers for your school or students? What do you expect from using them?
- Is there any idea that we have presented interest you the most?
- We have seen any plants using plastic bottles as the planter hanging outside of the classroom. Are there any agricultural program you are working on?
- Could the wasted beverage carton be used as the planter instead of plastic bottle?
- Is our project suitable for the school? If it is possible, can it be used in other school as well?
- Can we conduct children’s activity in your school?
- May we exchange contact information?
Appendix C: Interview Questions for Local Government

Interview Preamble

“We are a group of university students. We are working on a project with Doi Kham Food Products in Bangkok and Chiang Rai, Thailand. We are conducting interviews to learn more about the needs and priorities related to the implementation of re-use programs in Chiang Rai. Our goal is to develop a plan for repurposing Doi Kham Food Products’ waste juice cartons in order to benefit the Chiang Rai community.

Your participation in this interview is completely voluntary and you may withdraw at any time. If you would like, we would be happy to include your comments as anonymous, although it would be useful for the context of our findings.”

- What is/are your name(s) and how do you spell it?
  - รบกวนคุณชื่อ สกุล ครับ/ค่ะ
- What is your greatest concern for this community?
  - คุณและชุมชนมีความวิตกกังวลในด้านไหนเกี่ยวกับขยะที่เกิดขึ้นจากขั้นตอนการผลิตบรรจุภัณฑ์ดอยค้า
- Are there any specific needs or problems in the community you would like us to address?
  - คุณคิดว่าชุมชนมีความต้องการอะไรในการแก้ไขปัญหา?
- Would Chiang Rai resident need household goods/equipment that can be made from juice carton? (such as Green roof, cardboard, or furniture)
  - คุณเห็นว่าผู้ที่อยู่ในชุมชนต้องการสิ่งของที่จะทำจากขวดกระดาษ
- What are the main goals in this area for the next 5-10 years?
  - ในอีก 5-10 ปีข้างหน้าคุณมีความมุ่งหมายหรือโครงการอะไรที่จะแก้ไขเกี่ยวกับปัญหาขยะที่เกิดขึ้นจากโทรศัพท์มือถือ
- How does the waste impact the people who live near the factory?
  - ขยะที่เกิดจากโรงงานมีผลกระทบต่อชุมชนที่อาศัยอยู่ในบริเวณโรงงานอย่างไรบ้าง
- Where are all the waste facilities located in Chiang Rai province?
  - มีสถานที่ที่สามารถปฎิบัติภารกิจดูแลขยะได้อย่างไรบ้าง
- How could the government support this project?
  - ทางรัฐบาลสามารถสนับสนุนโครงการนี้อย่างไรได้บ้างไหม
- What potential partnerships do you see between you or some other organization and Doi Kham?
  - คุณเห็นว่ามีความมุ่งหมายเพื่อให้ชุมชนและบริษัทมีความมุ่งหมายสามารถรับรู้โครงการร่วมกัน
- May we exchange contact information?
  - ท่านสามารถให้เบอร์ติดต่อได้ไหมค่ะ/ครับ
- Who would you suggest we should contact in the local community?
  - ท่านจะแนะนำเราไปยังใครที่จะสามารถช่วยให้ได้ติดต่อได้บ้างครับ
Appendix D: Interview Questions for Phillip Baker

Interview Preamble

“We are a group of university students. We are working on a project with Doi Kham Food Products in Bangkok and Chiang Rai, Thailand. We are conducting interviews to learn more about the needs and priorities related to the implementation of re-use programs in Chiang Rai. Our goal is to develop a plan for repurposing Doi Kham Food Products’ waste juice cartons in order to benefit the Chiang Rai community.

Your participation in this interview is completely voluntary and you may withdraw at any time. If you would like, we would be happy to include your comments as anonymous, although it would be useful for the context of our findings.”

• Explain the Current Situation with Doi Kham
• Can you tell us a bit about your company?
• Can you explain the relationships between your farmers and the company? How is this organized?
• I know your contracts with your farmers entail supplying your seeds, and teaching/helping them grow your peppers - is there any transplanting process on that end? Or is it all seed to ground?
• We are thinking about using wasted juice cartons as planters, would you think that these cartoons would work for your farming setup?
• Knowing what you know about our company and situation do you think that planters would be a good idea for the Chiang Rai farmers?
• What do you think the main hurdles to using the planters would be?
• Do you have suggestions for overcoming these hurdles?
• Do you have any other ideas for uses of the Doi Kham juice containers?
Appendix E: Interview Questions for Ciudad Saludable

Interview Preamble

“We are a group of university students. We are working on a project with Doi Kham Food Products in Bangkok and Chiang Rai, Thailand. We are conducting interviews to learn more about the needs and priorities related to the implementation of re-use programs in Chiang Rai. Our goal is to develop a plan for repurposing Doi Kham Food Products’ waste juice cartons in order to benefit the Chiang Rai community.

Your participation in this interview is completely voluntary and you may withdraw at any time. If you would like, we would be happy to include your comments as anonymous, although it would be useful for the context of our findings.”

1. Explain our project
2. what is your position? What are you in charge of?
3. Can you explain the new model of Environmental Management of Solid Waste?
4. How did you organize the informal waste pickers into microenterprises?
5. Who funds the programs?
6. How do you pay the collectors?
7. About how many people are involved in the process?
8. How are you working with the local government?
9. What are the different types of solid waste that they recycle?
10. How did they deal with the juice carton type of waste?
11. Normally does the waste that the company receives come from donations or does the company buy it?
12. How do you separate the waste (by hand, for example)?
13. How many branches do you have?
14. When did this program start?
15. Do you have any sponsors? If so, who are they?
16. What is the goal of the company?
17. Are you planning to expand your business (microenterprise) into other cities, provinces, or countries? How do you plan on doing that?
18. How do you deal with disposal waste that caused pollution?
### Appendix F: Small Scale Feasibility and Impacts Table

<table>
<thead>
<tr>
<th>Feasibility and benefits tables</th>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Economic</td>
</tr>
<tr>
<td><strong>Short term solutions</strong></td>
<td></td>
</tr>
<tr>
<td>Planter</td>
<td>Advantage</td>
</tr>
<tr>
<td></td>
<td>Disadvantage</td>
</tr>
<tr>
<td>School supplies in art lesson</td>
<td>Advantage</td>
</tr>
<tr>
<td></td>
<td>Disadvantage</td>
</tr>
<tr>
<td>Hand craft</td>
<td>Advantage</td>
</tr>
<tr>
<td></td>
<td>Disadvantage</td>
</tr>
</tbody>
</table>
### Appendix G: Large Scale Feasibility and Impacts Table

<table>
<thead>
<tr>
<th>Factors</th>
<th>Economic</th>
<th>Environmental</th>
<th>Social</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long term solution</td>
<td>Repulping process - Fiber pattana - Green board - TCDC - Ampol Food</td>
<td>Advantage</td>
<td>Juice carton waste can be sold to be transformed into roof or furniture which is lightweight but high strength</td>
</tr>
<tr>
<td>Disadvantage</td>
<td>Cost of production and transportation</td>
<td>Air pollution comes from repulping process and transportation of the juice cartons</td>
<td>Does not directly involve local community members</td>
</tr>
</tbody>
</table>
Appendix H: Doi Kham Waste Data for September 2016 - January 2017

Doi Kham Waste Statistics for September 2016

<table>
<thead>
<tr>
<th>Type of cartons</th>
<th>Amount produced</th>
<th>Waste generated from the machine</th>
<th>Waste generated from the system (For example, quality check)</th>
<th>Total waste</th>
<th>Total waste (carton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 ml. Machine number 1</td>
<td>984,036.00</td>
<td>1.47%</td>
<td>0.73%</td>
<td>2.20%</td>
<td>21,680.00</td>
</tr>
<tr>
<td>200 ml. Machine number 2</td>
<td>1,307,359.00</td>
<td>0.66%</td>
<td>0.71%</td>
<td>1.37%</td>
<td>17,897.00</td>
</tr>
<tr>
<td>500 ml. &amp; 1,000 ml.</td>
<td>620,710.00</td>
<td>1.47%</td>
<td>1.61%</td>
<td>3.08%</td>
<td>19,122.00</td>
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<tr>
<td>200 ml. Speed line</td>
<td>6,372,986.00</td>
<td>0.36%</td>
<td>0.37%</td>
<td>0.73%</td>
<td>46,399.00</td>
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<tr>
<td>Total</td>
<td>9,285,091.00</td>
<td>0.59%</td>
<td>0.54%</td>
<td>1.13%</td>
<td>105,098.00</td>
</tr>
</tbody>
</table>

Doi Kham Waste Statistics for October 2016

<table>
<thead>
<tr>
<th>Type of cartons</th>
<th>Amount produced</th>
<th>Waste generated from the machine</th>
<th>Waste generated from the system (For example, quality check)</th>
<th>Total waste</th>
<th>Total waste (carton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 ml. Machine number 1</td>
<td>1,191,469.00</td>
<td>0.90 %</td>
<td>0.78 %</td>
<td>1.68%</td>
<td>19,997.00</td>
</tr>
<tr>
<td>200 ml. Machine number 2</td>
<td>736,661.00</td>
<td>0.77 %</td>
<td>0.69 %</td>
<td>1.46%</td>
<td>10,721.00</td>
</tr>
<tr>
<td>500 ml. &amp; 1,000 ml.</td>
<td>764,678.00</td>
<td>1.85 %</td>
<td>1.06 %</td>
<td>2.91%</td>
<td>22,279.00</td>
</tr>
<tr>
<td>200 ml. Speed line</td>
<td>5,101,593.00</td>
<td>0.46 %</td>
<td>0.40 %</td>
<td>0.85%</td>
<td>43,433.00</td>
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<tr>
<td>Total</td>
<td>7,794,401.00</td>
<td>0.69 %</td>
<td>0.55 %</td>
<td>1.24%</td>
<td>96,430.00</td>
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</table>
### Doi Kham Waste Statistics for November 2016

<table>
<thead>
<tr>
<th>Type of cartons</th>
<th>Amount produced</th>
<th>Waste generated from the machine</th>
<th>Waste generated from the system (For example, quality check)</th>
<th>Total waste</th>
<th>Total waste (carton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 ml. Machine number 1</td>
<td>1,112,525.00</td>
<td>0.56%</td>
<td>0.61%</td>
<td>1.16%</td>
<td>12,933.00</td>
</tr>
<tr>
<td>200 ml. Machine number 2</td>
<td>1,111,974.00</td>
<td>0.63%</td>
<td>0.60%</td>
<td>1.23%</td>
<td>13,702.00</td>
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<tr>
<td>500 ml. &amp; 1,000 ml.</td>
<td>943,362.00</td>
<td>1.73%</td>
<td>1.56%</td>
<td>3.29%</td>
<td>31,065.00</td>
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<tr>
<td>200 ml. Speed line</td>
<td>4,496,298.00</td>
<td>0.46%</td>
<td>0.41%</td>
<td>0.87%</td>
<td>38,902.00</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>7,664,159.00</strong></td>
<td><strong>0.65%</strong></td>
<td><strong>0.61%</strong></td>
<td><strong>1.26%</strong></td>
<td><strong>96,602.00</strong></td>
</tr>
</tbody>
</table>

### Doi Kham Waste Statistics for December 2016

<table>
<thead>
<tr>
<th>Type of cartons</th>
<th>Amount produced</th>
<th>Waste generated from the machine</th>
<th>Waste generated from the system (For example, quality check)</th>
<th>Total waste</th>
<th>Total waste (carton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 ml. Machine number 1</td>
<td>837,530.00</td>
<td>0.57%</td>
<td>0.70%</td>
<td>1.27%</td>
<td>10,610.00</td>
</tr>
<tr>
<td>200 ml. Machine number 2</td>
<td>1,183,172.00</td>
<td>0.63%</td>
<td>0.67%</td>
<td>1.30%</td>
<td>15,332.00</td>
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<tr>
<td>500 ml. &amp; 1,000 ml.</td>
<td>1,126,140.00</td>
<td>1.27%</td>
<td>2.00%</td>
<td>3.27%</td>
<td>36,814.00</td>
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<tr>
<td>200 ml. Speed line</td>
<td>5,843,181.00</td>
<td>0.31%</td>
<td>0.38%</td>
<td>0.69%</td>
<td>40,077.00</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>8,990,023.00</strong></td>
<td><strong>0.49%</strong></td>
<td><strong>0.65%</strong></td>
<td><strong>1.14%</strong></td>
<td><strong>102,833.00</strong></td>
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</table>
### Doi Kham Waste Statistics for January 2017

<table>
<thead>
<tr>
<th>Type of cartons</th>
<th>Amount produced</th>
<th>Waste generated from the machine</th>
<th>Waste generated from the system (For example, quality check)</th>
<th>Total waste</th>
<th>Total waste (carton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 ml. Machine number 1</td>
<td>1,047,900.00</td>
<td>0.49 %</td>
<td>0.76 %</td>
<td>1.26 %</td>
<td>13,192.00</td>
</tr>
<tr>
<td>200 ml. Machine number 2</td>
<td>1,052,140.00</td>
<td>0.62 %</td>
<td>0.72 %</td>
<td>1.34 %</td>
<td>14,112.00</td>
</tr>
<tr>
<td>500 ml. &amp; 1,000 ml.</td>
<td>1,225,764.00</td>
<td>0.80 %</td>
<td>1.81 %</td>
<td>2.61 %</td>
<td>31,994.00</td>
</tr>
<tr>
<td>200 ml. Speed line</td>
<td>5,166,668.00</td>
<td>0.21 %</td>
<td>0.38 %</td>
<td>0.59 %</td>
<td>30,476.00</td>
</tr>
<tr>
<td>Total</td>
<td>8,492,472.00</td>
<td>0.38 %</td>
<td>0.68 %</td>
<td>1.06 %</td>
<td>89,774.00</td>
</tr>
</tbody>
</table>
Appendix I: Microenterprise Handbook - English Version

คู่มือการสานตะกว้าจากกล่องบรรจุเครื่องดื่ม

จัดทำโดย: นิสิตชั้นปีที่ 3 ภาควิชาวิศวกรรม หลักสูตรนานาชาติ คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย และนักศึกษาชั้นปีที่ 3 คณะวิศวกรรมศาสตร์ Worcester Polytechnic Institute

ผู้สนับสนุนโครงการ: บริษัทดอยคำเลนด์แซนซ์อาหารจำกัด

1
Purpose of the Handbook

This handbook serves as a microenterprise outline that can be used to structure and start new microenterprise projects. In this case, we have outlined a plan for starting a microenterprise for weaving baskets using Doi Kham Food Products’ wasted juice cartons.

Social Impacts

1. Internal Stakeholders

› **Who stands to benefit from the enterprise**

  Members of the local community would benefit as employees of the enterprise.

› **What need/problem the enterprise addresses**

  This enterprise partially addresses the waste generation and management problem at Doi Kham’s Mae Chan factory.

› **Description of enterprise as a support model**

  The enterprise is a collaboration between Doi Kham and Mae Chan community members. In this program Mr. Thanapon Sitti (P’Phram), one of the CSR employee of the factory, will take a role as a leader of the enterprise who will manage the program and ensure its success. The local people will be hired to make the basket as their part time job and Doi Kham will assure to buy it back.
The basket will be given to customers along with Doi Kham’s products for special occasion of the company. The enterprise will not only be the support model that will bridge the relationship between both parties, but could also possibly be an alternative income for the local residents.

2. The Customer

- **Product functionality**

  Apart from its purpose of holding goods, the selling point of our products over the other baskets in the market is that it is being made from the discarded juice cartons. The process of making a wooden basket would normally involve cutting down trees as the raw material, and otherwise burning the wasted beverage cartons would produce carbon dioxide. This means that, by using our basket, the unnecessary amount of greenhouse gases could be reduced.
1. Market Analysis

- **Define target audience**

  The target audience is Doi Kham’s customers. The baskets would serve as a free gift with other products.

- **Gather relatable examples of success.**

  Joy at Work, a women’s enterprise in Bangalore has been upcycling wasted beverage cartons. It was originally started by Devika Krishnan, who has been part of various craft-based livelihood projects across India. Devika’s work in urban slums started in Bangalore in 2009, when she set up the Anu business unit in JanakiRam slum. In which, in four years has transformed into a private limited company completely owned and operated by the women from the slum. The products are not sold at regular retail stores since production is small and the stores often keep things on credit and pay up only when the items are sold. When quizzed about people’s reaction to their products, Devika said that people are interested once they realize that the accessories are made from Tetra Pak. No wonder then that their biggest seller is this, the Tetra Pak basket.
2. Marketing Strategy

› Sale and Distribution Avenues

This product would be sold and advertised as part of a premium ‘basket’ during special occasions. The basket would be distributed and sold at Doi Kham stores all over Thailand.

› Pricing (Dependent on Market Analysis)

The price of the product should be the same as the employee’s wage. The products are sold along with others Doi Kham product.

› Exposure Methods (Advertising)

Using the advertisement to promote the basket giftset by persuading the buyers that if they buy the gift set, it would help the local residents have the added income. In addition, by the reusing products, this may attract the people who concern about the environment as well.
Operations

1. Location

Pasang Community

Doi Kham factory

2. Equipment

I. Discarded cartons from the factory
II. Scissors
III. Colorful ribbons
3. Production Process

1. Cut both edge of the beverage carton and clean it well.

2. Cut the beverage carton to the size of 2.5 cm, edgewise.

3. Insert two cut pieces together into T-shaped.
4. Bring another cut piece to insert at the base of the T-shaped horizontally.

5. Bring the fourth cut piece and insert it into the third and first piece as the picture shown.

6. Pull all the four ends to tighten them together into square shaped.
7. Pull all the four ends to tighten them together into square shaped.

8. Repeat the seventh step multiple times to get the desired shape of basket.

https://www.youtube.com/watch?v=DZ1RzXzoYZc&feature=youtu.be
Employees

1. Positions and functions

Leader of the program: P'Phram, CSR employee from Doi Kham

Teacher: Teach the local residents to do the weaving.

Community members: Search for local people who are interested to make the basket for Doi Kham

Local resident: Workers who make the basket

2. Organizational structure of roles and responsibilities

The organizational structure will be top-down management. The order will start from the leader then go down to the community. The role of the leader is to command the workers to make sure that the quality of the basket reaches the standard. For the community members, their role is to find the local residents who is willing to do the basket as the added income. Lastly, the local residents will do the weaving baskets. Moreover, the bottom-up management will be added as well because sometimes the local residents may have some new ideas and then they can offer back to the generate new products.

3. Required training

A teacher is required to learn how to do the weaving baskets. Then, the workshop may be arranged at the weekend in order to teach the local residents and make sure the weaving baskets reaches standard.
Finances

1. Employees

- Wages
  The wages to hire P’Phram, or the basket weaving teacher should be equal to the minimum wage per day (300 baht). The price that Doi Kham buys the basket back should be equal to the wage that the local community will gain.

2. Capital & Sales

- Recyclable (non) profit
  Break even strategy will be used to build relationship between Doi kham and local residents. Other than the main purpose of getting rid of these wasted beverage cartons, Doi Kham could maintain the relationship between the local residents by providing extra income to increase their standard of living.

Development

1. Internal relations

By doing the CSR project, it will satisfy the local residents and increase the relationship with Doi Kham. This will also create a good reputation for Doi Kham by giving something back to the community.
คู่มือการสาดน้ําจากกล่องบรรจุเครื่องดื่ม

จัดทำโดย : นิสิตชั้นปีที่ 3 ภาควิชาวิศวกรรม สิ่งทอ คณะวิทยาศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย และนักศึกษาชั้นปีที่ 3 คณะวิศวกรรมศาสตร์ Worcester Polytechnic Institute

ผู้สนับสนุนโครงการ : บริษัทยอดค้าผลิตภัณฑ์อาหารจ้ากัด
จุดประสงค์ของคู่มือ

คู่มือนี้จัดทำขึ้นเพื่อเป็นแนวทางการปฏิบัติการเริ่มสร้างธุรกิจขนาดย่อม โดยคู่มือนี้เกี่ยวข้องกับการสนับสนุน โดยให้กล่องของฉันผลไม้ค่อยๆ

ข้อมูลผลิตภัณฑ์

ผลิตภัณฑ์ในคู่มือนี้คือกระดาษของขวัญ ที่ทำจากกล่องผลไม้ กล่องผลไม้ค่อยๆ โดยกล่องผลไม้ต้องไม่เหล่านี้เป็นช่องที่เกิดจากกระบวนการผลิต

บทนำ

1. ที่มาและจุดประสงค์ของโครงการ

* ที่มาของโครงการ

โครงการนี้เป็นความร่วมมือของบริษัทท้องถิ่นา浍า ท่าบ้าน จังหวัดเชียงราย โดยผู้ผลิตผลิตภัณฑ์ ที่ทำจากกล่องผลไม้ค่อยๆ โดยกล่องผลไม้ต้องไม่เหล่านี้เป็นช่องที่เกิดจากกระบวนการผลิต

* จุดประสงค์ของโครงการ

โครงการนี้จัดตั้งขึ้นเพื่อเป็นหนึ่งในกิจกรรมแก้ไขปัญหาเกษตรจากกล่องผลไม้ ไม่ใช่งาน terra ภาษาที่ 2 ท่าบ้าน จังหวัดเชียงราย
2. ประโยชน์ของโครงการในแต่ละวัน

› โครงสร้างผู้ได้รับประโยชน์จากโครงการ

ข้าวบ้านในชุมชนป่าช้าง ถือเป็นอยู่ที่สำคัญสำหรับโครงการนี้

› ข้อคิดและข้อเสนอแนะของผู้มั่นคงที่ได้จากโครงการนี้

แตกกระดาษกล่องเหลืองใส่เก็บข้อมูล นอกจากจะสามารถใช้แทนกระดาษที่ไปแล้ว
ห้องที่ทำให้ผลิตภัณฑ์นั้นแตกต่างจากกระดาษทั่วไปคือ เป็นผลิตภัณฑ์ที่ได้จาก
การใช้กล้องน้ำผลิม แทนที่การใช้กระดาษธรรมชาติ ด้วยการตัด
ตัวใหม่เพื่อนำมาสำหรับกระดาษ นอกจากนี้ยังเป็นการช่วยลดพลังงาน เพราะการนำ
ขยะประเภทกล่องบรรจุเครื่องดื่ม ถูกให้เกิดก๊าซเรือนกระจก
กลุ่มเป้าหมาย

1. วิเคราะห์กลุ่มเป้าหมาย

ตัวอย่างของโครงการในลักษณะเดียวกันที่ประสบความสำเร็จ

Joy at Work (จอย แอท เวิร์ค) สำขารถกลุ่มแห่งบ้านในรัฐ พังงา ของประเทศ อินเดีย ทำโครงการโร่เคลื่อนต่องรเรียกทีม โดยมี ดร.กิริน (Devika Krishnan) ผู้ช่วยเชี่ยวชาญด้านงานประสิทธิภาพของประเทศอินเดียเป็นผู้ก่อตั้ง โครงการในปี 2532 โดยในระยะแรกนั้น เป็นเพียงกลุ่มสำหรับนักเรียนใน สถาบันการศึกษา (JanakiRam slum) ปีต่อมา ดร.กิรินได้ขยายจากกลุ่มสำหรับนักเรียน กลุ่มเล็กๆ กลายเป็นบริษัทเอกชน
ชื่อโปรเจ็คท์การจัดการโดยกลุ่มแม่บ้านที่พักอาศัยในผลิตภัณฑ์ ผลิตภัณฑ์ของโครงการ Joy at Work คือ ตะกร้าจากกล่องบรรจุภัณฑ์เตาครา แพค (Tetra Pak basket)

สามารถค้นหาข้อมูลเพิ่มเติมได้ที่ : https://www.google.co.th/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8&q=joy+at+work+womens+coop+india+tetrapak

2. กลยุทธ์ทางการตลาด

- สถานที่ผลิตและจัดจำหน่าย

ผลิตภัณฑ์ที่ได้จากโครงการผลิตขึ้นโดยชาวบ้านชุมชนปากบาง อ่างเก็บแห้ง จังหวัดเชียงราย โดยมีบริษัทย่อยค้า เป็นสู่รับซื้อ และจัดจำหน่าย โดยจะทำการจัดซื้อ ผลิตภัณฑ์แล้วไปส่งท่านที่อยู่ในท้องถิ่น เพื่อให้ได้รับบริการอย่างทั่วถึง
รายการ (ข้อมูลเกี่ยวกับการวิเคราะห์สถานการณ์ทางการเกษตร)

รายการข้อมูลของผลิตภัณฑ์ต้องมีความสอดคล้องกับตำแหน่งในการผลิต และทางบริการด้วยค่าต้องคำนึงถึงทั้งหมดของקרהการขับของวัคซีน เนื่องผลิตภัณฑ์นี้นำไปใช้จัดทำหน่วยรวมกับสินค้าอื่นๆของตลาด

การเชื่อมโยงผลิตภัณฑ์

นำลูกเติมของโครงการมาใช้ในการเชื่อมโยงผลิตภัณฑ์ตัวอย่างเช่น ผู้บริโภคสามารถซื้อวิคัยลูกเติมผลผลิตและสร้างรายได้ให้กับธุรกิจได้มากกว่า ด้วยการใช้ผลิตภัณฑ์ของโครงการ เนื่องผลิตภัณฑ์นี้ได้จากการวิจัยเพิ่มขั้นช่วยลดผลิตภัณฑ์ และทำขึ้นโดยกลุ่มสหกรณ์ชาวบ้าน

การดำเนินงานของโครงการ

1. ตำแหน่งที่ตั้งของโครงการ

ชุมชนป่ายาง

โรงงาน ดอยคำ
2. อุปกรณ์ที่ใช้

I. กล่องน้ำผลไม้จากโรงงานดอยคำ
II. กระโกร
III. ริบบันสิ

3. วิธีการสะสมถังร่างจากกล่องบรรจุเครื่องดื่ม

1. ตัดกล่องที่ท้าทว่าและด้านท้ายของกล่องจากมัน้สังกลองให้สะอาด
2. นำกล่องมาตัดขนาด 2.5 ซม. (ทางขวา) ปลายข้างนิ้วนิ้ว

3. นำชิ้นส่วนกล่องที่ตัดแล้วมาส่งเลื่อน จากนั้นเอายาสอดกันให้ติดอยู่ในรูปตัว T

4. นำชิ้นส่วนกล่องที่ตัดแล้วมายึด 1 เส้น นำยาสอดทับบนเลื่อนที่ 1 กับ 2 (แนวตั้ง)
5. นำชิ้นเส้นที่ 3 และสอดกับเข้าไปในชิ้นส่วนกล่องแคมเส้นที่ 1 เพื่อจะทำให้ซ้อนกันเป็นตารางรูปสี่เหลี่ยม

6. ติ่งปลายแต่ละด้านให้แน่น
7. นำชุดของต้อง 1 ชุดมาแสดงทับกับปลายด้านบน(เส้นแนวตั้ง) และนำชุดข้อต่อนิยามอนามาแสดงทับเส้น(แนวนอน)

8. ทำแบบนี้ข้าไปเรียงๆจนได้ความยาวสูง รูปทรงและขนาดตามที่เราต้องการและสามารถตกแต่งเพิ่มเติมได้ เช่น ใส่ลายสะพาย

https://www.youtube.com/watch?v=DZ1RzXzoYZc&feature=youtu.be
การว่าจ้างงาน

1. ตำแหน่งและหน้าที่

ผู้นำโครงการ - คุณ ธนพล สิทธิ์ (พี ปรับปรุง) ทํางานเกี่ยวกับกิจกรรมเพื่อส่งผลให้กับโรงงานด้อยค่า เมื่อจัน

ผู้สอน - สอบรายบานดําบลับภาษาในการสานต่อ

ผู้เข้าชมชม - คุณพ่อคุณแม่ที่มีสนใจในการทําเครื่อง

ชาวบ้านดําบลับภาษา - ผู้ที่สนใจทําเครื่อง

2. ระบบการบริหารจัดการหลักของโครงการ

ระบบการบริหารจัดการหลักที่จะถูกนำมาใช้คือ top-down management ซึ่งระบบการส่งสารจะทําหน้าทําหน้าที่มีความคุ้นเคยของผู้แทนโครงการ โดยหน้าที่หลักของหัวหน้าผู้ให้การส่งสารและควบคุมคุณภาพของตกผลิตให้ได้มาตรฐาน รวมทั้งหัวหน้าผู้แทนที่จะต้องทําหน้าที่ควบคุมการที่ได้มาVBoxLayout

โครงการสานต่อเครื่องนี้ นอกจากนี้ระบบ bottom-up management จะถูกนำมาใช้รวมตัวรวมเพื่อให้ได้รับผลเป็นภาพจากการทํางานจริง และสามารถแก้ไขหรือปรับให้รวมไปถึงการคิดค้นนวัตกรรมใหม่ๆ ให้เกิดประสิทธิภาพสูงสุด

3. ผู้สอน

โครงการนี้ต้องการผู้สอนในการทําเครื่องจากที่ผ่านหน้าโครงการบริหารจัดการประชุมเชิงปฏิบัติในทุกๆ สถานที่ เพื่อที่จะสอนการทำเครื่องและตรวจสอบว่าผลิตภัณฑ์ที่ได้เน้นเป็นไปตามมาตรฐานของบริษัทหรือไม่
การเงิน

1. แรงงาน

คำเร่ง
อัตราค่าแรงงานอาจหักหน้าโครงการ (คุณสมบัติหรือคุณสมบัติที่ต้องการที่เท่ากับค่าแรงขั้นต่ำ (300 บาทต่อวัน) ซึ่งราคาที่ต้องการค่าใช้สินค้ากลับมาหนึ่งจะกลับเป็นรายได้ที่คนในชุมชนควรได้รับ

2. ต้นทุนและข้อดีของโครงการ

โครงการนี้ยังเป็นโครงการประเภทไม่แสดงผลกำไร

เหตุผลในการหาคู่คุณจะถูกกำหนดให้เพื่อสร้างความสัมพันธ์ที่ดีของบริษัทและชุมชน ซึ่งแตกต่างเหล่านี้อาจเป็นงานที่คนขาย

โดยไม่หวังผลกำไรเนื่องจากจุดประสงค์หลักของการนำกล่อง

น้ำผลไม้มาทำการแปรรูปเพื่อส่งสัมพันธ์กับคนในชุมชนเป็น

หลัก มิใช่เพื่อการค้าหรือการจำหน่าย นอกจากนี้ยังเป็นการทำรายได้เสริมให้แก่คนในชุมชนอีกด้วย

ความสัมพันธ์ระหว่างบริษัทและชุมชน

จากโครงการนี้คุณจะตอบสนองความต้องการของชุมชนด้านตลาด และเพิ่มความสัมพันธ์ระหว่างบริษัทจะได้รับค่าซึ่งการส่งเสริมโครงการนี้ยังเป็นการสร้างชื่อเสียงที่ดีให้แก่บริษัท โดยการเห็นแก่ประโยชน์ของคนในชุมชน พร้อมทั้งพัฒนาความเป็นอยู่ของคนในชุมชนให้ดียิ่งขึ้นไป