



**IGNORED BOUNTY CREATING VALUE  
FROM BIO RESOURCES**



**BY  
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**A THESIS SUBMITTED IN PARTIAL FULFILLMENT  
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จากทรัพยากรชีวภาพ



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FROM BIO RESOURCES**

by

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Nitipong Pukcharoen  
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## กิตติกรรมประกาศ

งานวิจัยนี้จะไม่สามารถเป็นไปได้หากปราศจากการสนับสนุนที่ดีจากอาจารย์ Sridhar, อาจารย์ ชินพ, อาจารย์ David สำหรับข้อเสนอแนะเชิงปฏิบัติและการสนับสนุนที่ดีเยี่ยม และขอขอบคุณเพื่อนร่วมชั้น MFA Design พวกเขาให้ความช่วยเหลือฉันอย่างมากเมื่อฉันทำวิจัย

นิติพงษ์ พุกเจริญ  
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### Abstract

Leaves are an integral part of nature that is vital for growth. Is the growth of the tree in the good or the wrong direction? Another factor is that Leaves can affect the cycle of humans and the world. Whether it is people of the world's ecosystems, these problems have been going on for 10 to 20 years, and leaves are among the top contributors to ecosystem destruction. This, in turn, also helps support the ecosystem that humans have destroyed.

The author, therefore, studies the composition of leaves. About adding value to materials. It can be reused or modified methods to optimize the natural wilt of leaves. The rotation of natural resources concerning the ecosystems created by nature is more valuable. The benefits are far-reaching and can also balance the world's ecosystems and reduce the natural problems caused by leaves in another way. All of which help alleviate leaf problems. The process begins with an outline of all possible ideas that might solve the problem. Then the most suitable idea is selected and developed into several prototypes. After some improvements, the final prototype was a success.

(Total 36 pages)

Keywords: Sustainable, Substitute, Biodegradable, Cycle

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### บทคัดย่อ

ใบไม้เป็นส่วนหนึ่งของธรรมชาติที่มีความสำคัญต่อการเจริญเติบโต การเจริญเติบโตของต้นไม้เป็นไปในทิศทางที่ดีหรือผิด อีกปัจจัยหนึ่งคือ ใบไม้สามารถส่งผลกระทบต่อวัฏจักรของมนุษย์และโลก ไม่ว่าจะเป็นคนหรือระบบนิเวศของโลก ปัญหาเหล่านี้ดำเนินมาเป็นเวลา 10 - 20 ปีแล้ว และใบไม้ก็เป็นตัวแปรอันดับต้น ๆ ในการทำลายระบบนิเวศ ซึ่งทางกลับใบยังช่วยสนับสนุนระบบนิเวศที่มนุษย์ได้ทำลายไป

ผู้เขียนจึงศึกษาเป็นเรื่องเกี่ยวกับองค์ประกอบของใบไม้ เกี่ยวกับการเพิ่มมูลค่าให้กับวัสดุที่ใครๆ ก็สามารถนำกลับมาใช้ใหม่หรือปรับเปลี่ยนวิธีการเพื่อให้ใบไม้ที่ช่วยตามธรรมชาติได้อย่างเหมาะสมที่สุด การหมุนเวียนทรัพยากรธรรมชาติโดยคำนึงถึงระบบนิเวศที่สร้างขึ้นโดยธรรมชาติ นั้นมีค่ามากกว่า ประโยชน์จะกว้างไกลและยังสามารถรักษาสสมดุลให้กับระบบนิเวศของโลกและลดปัญหาทางธรรมชาติที่เกิดจากใบไม้ได้อีกทางหนึ่ง ซึ่งทั้งหมดนี้ช่วยบรรเทาปัญหาเรื่องใบ กระบวนการเริ่มต้นด้วยโครงร่างของแนวคิดที่เป็นไปได้ทั้งหมดที่อาจแก้ปัญหาได้ จากนั้นจึงเลือกแนวคิดที่เหมาะสมที่สุดและพัฒนาเป็นต้นแบบหลายแบบ หลังจากการปรับปรุงบางอย่าง ต้นแบบขั้นสุดท้ายก็ประสบความสำเร็จ

(วิทยานิพนธ์มีจำนวนทั้งสิ้น 36 หน้า)

คำสำคัญ: ยั่งยืน, ทดแทน, ย่อยสลาย, วัฏจักร



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# Chapter 1

## Introduction

### 1.1 Background

Today, a trend wants to save the world and help restore the environment, including creating green cities. All of which are advantages of returning to the near and wanting to preserve the environment for the better of humans and the world. These are the currents that invite one's desire to do something in order to be able to heal or protect—however, vice versa. Some factors can cause such currents to be left without being picked up. Therefore, we have an idea to pick up the trend that wants to save the world from supporting the way or ideas to change to help maintain balance and create more value for the material.

### 1.2 Objective

1.2.1 To look at the potential hidden lying in them and convert then into valuable products.

1.2.2 Study the various bio-based materials being developed and study possible applications.

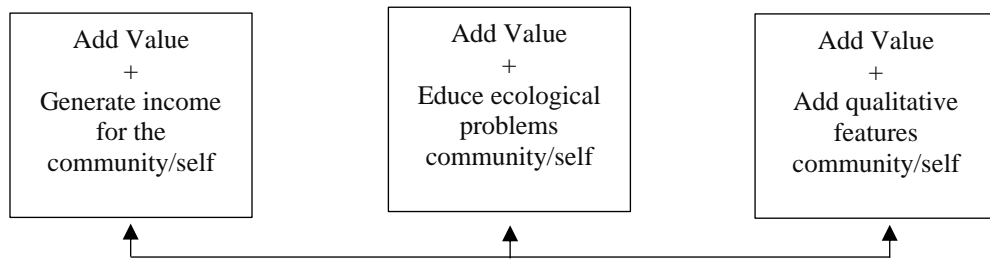


Figure 1.1 Conceptual framework or theory used as a research model

### 1.3 Scope of the study

- 1.3.1 Study the basic properties of leaves.
- 1.3.2 Study the benefits of materials for stable income generation.
- 1.3.3 Find out about the localization of leaves or changing properties in a good way.
- 1.3.4 Learn how to use natural materials to maximize benefits and earn your income.
- 1.3.5 Environmental qualification and suitability analysis for environmental protection.



## **Chapter 2**

### **Literature Review**

This research studies documents and reflections on how to use resources most efficiently by studying textbooks, articles, theories, and research related to the degradation of nature. To be used as the foundation of the design concept, they are presented in the following order of topics.

- 2.1 The concept of recycling & upcycle
- 2.2 The concept of Biodegradable
- 2.3 Case study

#### **2.1 The concept of recycling & upcycle**

Recycling is the process of collecting materials and turning them into new products. Otherwise, these products will be disposed of in the trash. However, it can be concluded to protect natural resources and reduce the overuse of raw materials. So, it protects the habitat. However, it has many advantages. It also saves energy. This is because recycled products simplify many of the basic steps in the manufacturing process. In other words, more energy is needed to extract, distill, transport, and process raw materials than to replace existing recycled materials.

Upcycle is also the use of recycled materials. For future use, plastic cutlery and plastic bottles are recycled without compromising the quality and composition of the material for future use. However, most often, it cannot be reverted to a container involving anything that can be consumed due to the risk of something seeping into the plastic. As a result, these things will be upcycled into objects such as rugs, toys, benches, lamps, and vases, in which case the recycling will not be available because all the waste seeps into the plastic cannot be removed. If recycled, new products may be



of inferior quality and value. such as producing a new item that is not plastic cutlery or plastic water bottles for consumption as before.

Upcycle summary is the use of materials from different products that have already been used. To create something new is different from Recycle because when going through Upcycling or Upcycled, the product will not be the same again. for example, you can change your old t-shirt. By cutting a little sleeve or neck and sewing the bottom. Turning it into a cloth bag for storing things is called simple upcycling or giving new life to an old t-shirt. This extends the period of use of t-shirts in a different form than before. This is different from recycling because if it is recycled, old t-shirts can be converted back to fabric used to make t-shirts again.

## **2.2 The concept of Biodegradable**

Biodegradation is the process by which organic matter reacts with inorganic substances. Decompose which organic matter is converted to minerals by functioning microbial cells to increase the biodegradation process. General decomposition uses organic matter such as plants, animals, and other substances produced by living things. Alternatively, objects similar to plants and animals allow microorganisms to be used. Some microorganisms occur naturally. The microorganisms are diverse in the process of creation. lead to degradation change of form.

## **2.3 Case study**

### **2.3.1 Beleaf chair**

It is a project by Simon Kern, who wants to turn natural materials into furniture. To conserve resources and be able to biodegrade naturally is like creating endless furniture. They can be picked up and rebuilt anytime, such as damaged furniture. Just put the furniture under the tree or the area covered by the tree to become a natural fertilizer, causing the plant to grow and be more plentiful (Kern, 2017). "Look around



you. Plastic is everywhere, even. though human society said 40 years ago that plastics are not affordable anymore. What if we can replace them with nature? My project is focused on practical use of garbage leaves from the cities in the furniture industry. Imagine a tree. Trunk and the branches grow. for hundreds of years".

The Simon Kern prototype chair began to use 100% natural materials by making the most of that material. The process of making a chair prototype uses standard components, and there is no environmental or ecological impact of using waste products. For example, bio-resin at Kern is extracted from waste vegetable oil and road leaf as the primary material used in the prototype chair. The whole process is to frame the material to add usefulness or value to the material that can be substituted for the surrounding things by considering the elements that must be naturally biodegradable and not destroy the ecosystems of those natures.

Furniture Properties (Kern, 2017) "If it gets damaged, we just put it under the tree, where it disappears into the soil and fertilizes a tree Then we pick the fallen leaves once again, and make a new seat".



Figure 2.1 Prepare the materials that can be obtained

Source: Kern, 2017



Figure 2.2 Shaping process

Source: Kern, 2017

This is the process of Simon Kern's work. Figure. 2.1, the leaves to be used are separated into sacks and left to dry so that the leaf components are dehydrated. It will be easier to do the next step. Figure. 2.2 is a molding process using prepared blocks. in order to be able to style or decorate as desired.



Figure 2.3 Keep a few details

Source: Kern, 2017



Figure 2.4 Processing details

Source: Kern, 2017

Figures 2.3 – 2.4 show the details of the material that has been molded into a chair. Moreover, to keep the details for beauty to show the uniqueness of the material, every material used by Simon Kern has its role and function, according to Simon “Imagine we can make the same circle in reality of furniture. There is a skelet of a chair (trunk and branches), made in a way that it can survive for hundreds of years. Then, we have a seat (leaves), which is not so strong, so after year, if it gets damaged, we just break it and put it under the tree where it disappears in the soil and fertile a tree. Then we pick the fallen leaves once again, and make a new seat. In my project, I invented a new material, by mixing and pressing the fallen leaves and a bio resin, so the seat is completely biodegradable and can easily continue in its natural cycle. Nature is a future. We just need to beleaf, that there is a way how we can change this world.” (Kren, 2017)



Figure 2.5 Chair from the Beleaf Chair project

Source: Kern, 2017

### Summary

Materials can be obtained from nature and are helpful in many ways. Regarding ecosystems, environments, and processing, the importance of materials is not only assessed as being able to create value. Instead, it assesses the value of a resource that can be recycled over time without sacrificing the ecosystem or the environment.

The process is simple, using standard but efficient and easy-to-find components that reduce costs. in spending and reducing resources in another way.

Cycles and Biodegradation significantly impacts the ecosystem and the environment by using cycles as its circulatory system. It does not affect or pollute and can be reused at any time.

- 1) Customizable and easy to make.
- 2) Safe, the equipment used has some strength.
- 3) Simple, no complexity, easy access to each part.



### 2.3.2 Cheer Project

The Cheer project wants to turn natural materials into goods or generate income for the community in the Himachal region. It is an experiment to understand the potential forms of natural materials in the Himachal region and the possibilities of such materials in the ever-growing demand for alternatives.

The project is research on pine needles that need to be transformed from natural materials into 100% biodegradable materials. “These forests cover most of Himachal and Uttarakhand. However, these states are facing a dangerous problem posed by large numbers of dry pines on the forest floor. This causes frequent wildfires and other environmental problems. many more with a forest cover area of about forty thousand square kilometers. The damage is incalculable, and there is no significant solution to the problem.” (Wali, 2019)

The process of this project considers the ecosystem and environment as the number one priority. The whole process uses natural materials to reduce the problem of overflowing the world and to increase the value of the material to be unique, such as using local vegetables and spices, which are natural materials readily available in the market. Overflow The components of this project are 100% biodegradable and recyclable. Moreover, it does not cause pollution or waste in the process. It is the solution to the global plastic problem.



Figure 2.6 Design Process

Source: Wali, 2019



Figure 2.7 Month Long Experimental Workshop with Twenty Local Women

Source: Wali, 2019



Figure 2.8 Early Prototypes

Source: Wali, 2019



Figure 2.9 Prototypes

Source: Wali, 2019



Figure 2.10 Final Prototypes

Source: Wali, 2019

The cheer project is a community project aiming to reduce bushfires caused by pine trees, combine the best use of local materials, and add value to often overlooked materials. Bringing pine needle material to make this project is the use of natural materials to create transformations and produce materials that can be modified according to the villagers' way of life by giving the community a component to make this project come up.

#### Summary

- 1) Materials are easy to find by region of origin.
- 2) Add value to the material.
- 3) Protecting the environment helps reduce the root of the problem.

### 2.3.3 OUTONO

This project wants to use natural materials to be transformed into substitutes for leather materials. Natural materials require five years of research to obtain a process and performance similar to leather. Which all is using sustainable materials that can replace materials from killing or harming animals in order to use them to make bags, shoes, or clothing, “The production of this material helps to clean the environment. Unlike most other plant textiles, leaf parchment is not blended with other fibers. The production of this material helps to clean the environment. Unlike most other plant textiles, leaf parchment is not blended with other fibers”. (Kaeru, 2019)



Figure 2.11 A greenhouse where elephant ears are cultivated

Source: Kaeru, 2019



Figure 2.12 It is dried in preparation for tanning technology

Source: Kaeru, 2019





Figure 2.13 Details after tanning

Source: Kaeru, 2019



Figure 2.14 Chairs from elephant ears and the use of tanning technology

Source: Kaeru, 2019



Figure 2.15 Products from elephant ears

Source: Kaeru, 2019

#### Summary

I think this project is another way to promote renewable resources. Natural resources are readily available and critical in creating new challenges. They are a model for using renewable and sustainable resources to replace leather materials.

## Chapter 3

### Materials and Methods

#### 3.1 Survey data collecting

Data by observing the degradation behavior of leaves, including interviews in the case of community sources affected by leaves that have fallen on the ground, such as neighbors with large trees or the middle of the community with large trees. The leaves strewn on the road caused the aftereffects. Provide advice on solving various problems. Solutions were analyzed and summarized.

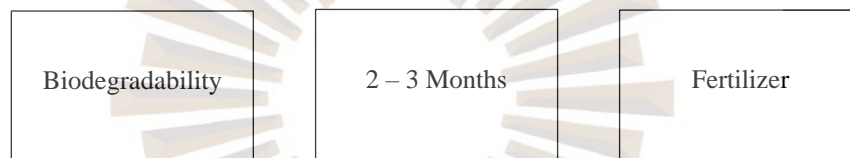


Figure 3.1 Decomposition process

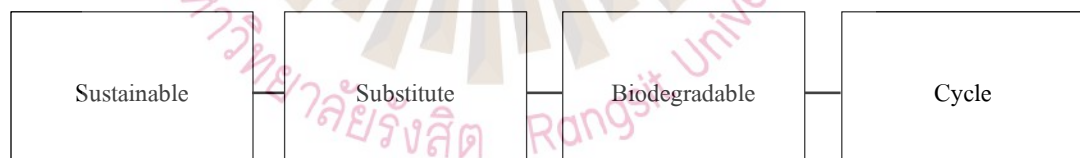


Figure 3.2 Conceptual principals for the design

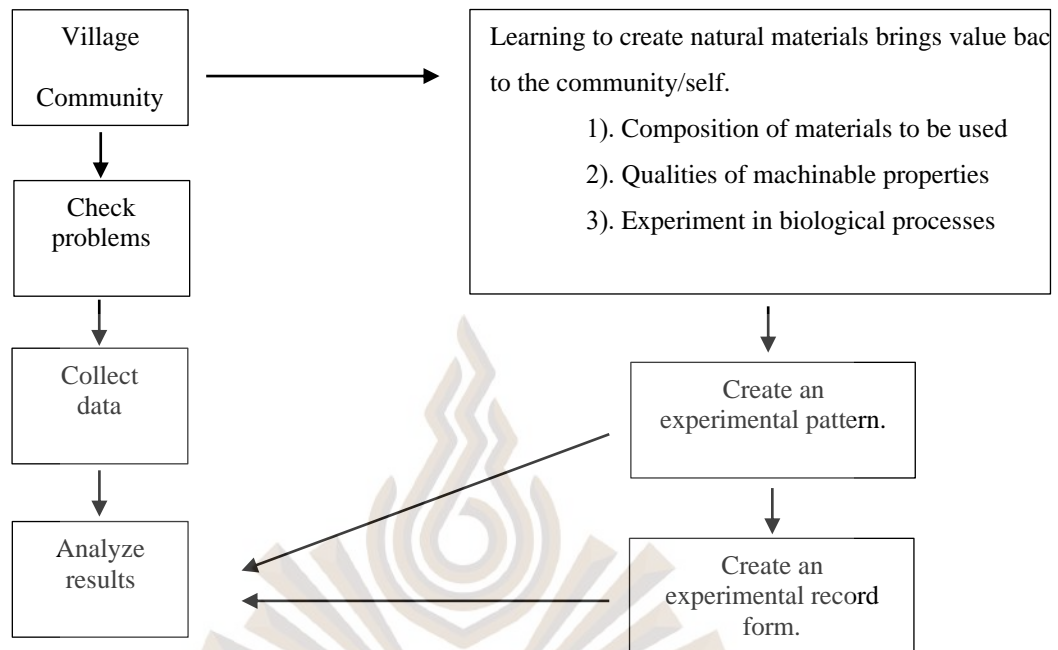


Figure 3.3 Show the relationship between the conceptual research framework

## 3.2 Design concepts

Create products are locally made, creating employment for locals as well as harnessing their rich natural resources in making sustainable products from the bounty of nature.

## 3.3 Design process

3.3.1 Look at ways the properties of leaves are altered and make them more usable.

3.3.2 Consider various applications of these new materials and processes.

3.3.3 Adding value by designing various product.

### 3.4 Sketch design & 3D model

#### 3.4.1 Sketch design type 1

The design principles emphasize creating natural products that can replace today's things. To reduce the problems caused by the leaves, although some of the impacts are small, there may be a significant impact if it is started for a long time as well as being able to use for natural benefits and can create a way to increase income for the community or solve problems caused by leaves. This may generate revenue in a large area and be the most helpful leaf recycling starting point. As a result, it is a sustainable problem-solving process and can also be a good substitute for materials. The authors collected sketch ideas and mockups. All of these represent different ideas to be described in detail below.



Figure 3.4 Design process

From the research, it was found that to make the leaves decompose quickly, it is necessary to take into account the microorganisms that are the decomposers of the leaves by adding microorganisms to the mix and considering the nutrients that are suitable for the plant to digest. Decay of leaves, Therefore, all components must be suitable and maintained in the best condition without damaging the tree or its roots. They all use all natural materials to provide a great source of nutrients for the trees they grow. I got the idea of sketch by using the pepper mache technique that can be molded into the desired shape.

### 3.4.2 3D Model type 1

Initially, I had figured out the process, including steps of fertilizing, watering, or changing the soil, to reduce the process or reduce spending resources for a new approach that can be used to modify the way of use and create more value and more valuable than just conventional materials waiting to be biodegraded.

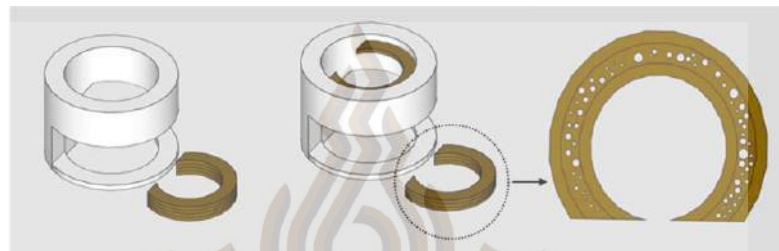


Figure 3.5 Details of the process from natural fertilizers

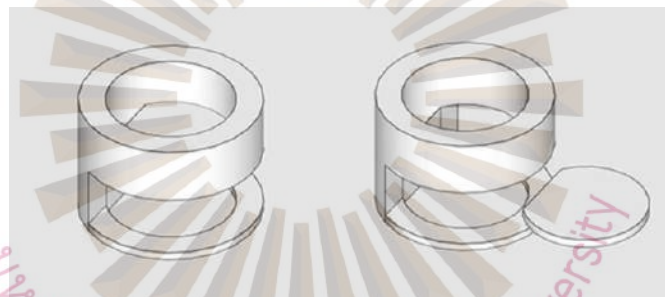


Figure 3.6 Removing the lower pickup for soil replacement

From research, we learn the adverse effects of the work process. The workflow cannot be reduced to many steps. Each different steps are important and have different functions, for example, watering is important for the soil to increase moisture and aeration. The fertilizer's duration must consider the proper nutrition and decomposition time. This is because the longer it takes, the faster the nutrient feather intensity disappears, which directly affects the plant.



### 3.4.3 3D Model type 2

It is an additional idea from the type 1 formed. From the research, it has been adjusted in the direction of using all elements as a single element to focus on the process of growing plants perfectly, by not giving too much minerals and part of it to make a better forecast for the future. This is a concept that is used in fragmentation to take into consideration that plants do not require excess minerals. At that time, it was also possible to preserve natural fertilizers more easily.

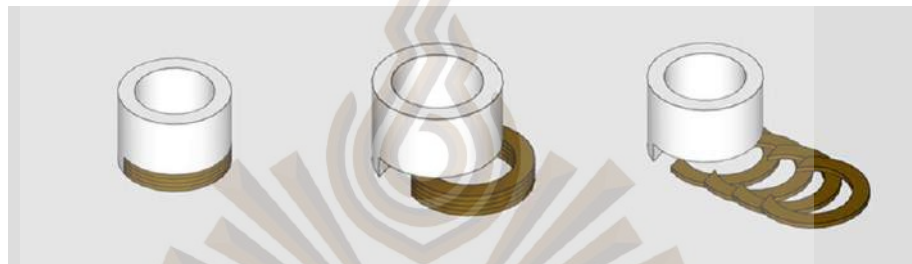


Figure 3.7 Details for Fertilizers that can be broken

In the end, from this point of view, there is still a lack of use of natural materials. Considering the reduction of the use of various resources, even if we make natural fertilizers, the materials used as pots cannot be made from natural materials. Because it has to be affected by plants, such as fertilizing, reducing water, or planting, all the pots must have a particular strength to help plants grow. The reaction will naturally decompose if the pot is made of natural materials such as leaves.

### 3.4.4 3D Model type 3

It is an extension of the concept in form type 2 because just making fertilizer seems to add too little value to the things we pick up. However, if we think and design with consumers in mind, whether making it easier or faster, it may benefit consumers and add more value to things. In thinking and exiting, a design takes the traditional approach to simplify or minimize the process and not take too much time or help the consumer be more attentive. When there is more time than usual, reducing the process.

of planting trees will encourage consumers to need more time; when consumers have more time, it will positively affect what they grow, for example, more care. Alternatively, enjoy the rest of the time.



Figure 3.8 Process details of use

From research and advice. The whole process was a simplification of the cultivation process. All of them are the same as in all combinations, such as adding water to the tank to react with natural, homemade fertilizers. It caters to customers who need more time or wants to reduce their time on them more. Through advice or experimentation, the authors felt that the processes benefited customers needing more time. However, the opposite effect was too much of a business model. Moreover, the material is still an ecologically destructive material such as plastic, which the authors have kept in detail for future development.

#### 3.4.5 3D model type 4

It is an idea designed with degradation in mind and saves each person's lifetime or cost to have more time than before. Do not waste time on things that are too fussy or too many steps. Products come in two forms; Figure 3.9 allows the rope to absorb the water upward to reacted composition. Figure 3.9 The base is placed in the water tank to increase the danger of accelerating the absorption.





Figure 3.9 Rope to absorb the water, Water tank

This product saves time, increases user time, and helps save water save time save the world, and plants grow better as it encourages keeping and having time to do many other things.

Summary of all formats I chose the sketch design type 1 model because, in the sketch design type 1 model, I viewed the use of natural resources as a need to be circulating and still extended. In the experiment, I have seen the use of natural resources that can significantly add value to materials and that these natural resources cannot destroy ecosystems or the environment. So, I thought of researching according to the natural principles of cultivation. Because cultivation requires care and attention to ensure perfect growth. Every step is made from natural materials that support the base material and add value.

I use the concept of a paper mache technique that can be molded into various shapes and dimensions. This also indicates the uniqueness of bringing things that are not used to bring benefits. Using this technique helps promote quality that matches the concept of sustainable nature in the future.



Figure 3.10 Paper mache

Package, concepts, or designs that are resource-saving and use natural materials to reduce problems and biodegrade over time.

The design considers the user who can use it for further use or as a support for the product in the future.

- 1) It does not pollute the environment to stop global warming or pollution.
- 2) Biodegradable naturally
- 3) It is a direct and indirect way to help society in solving problems.

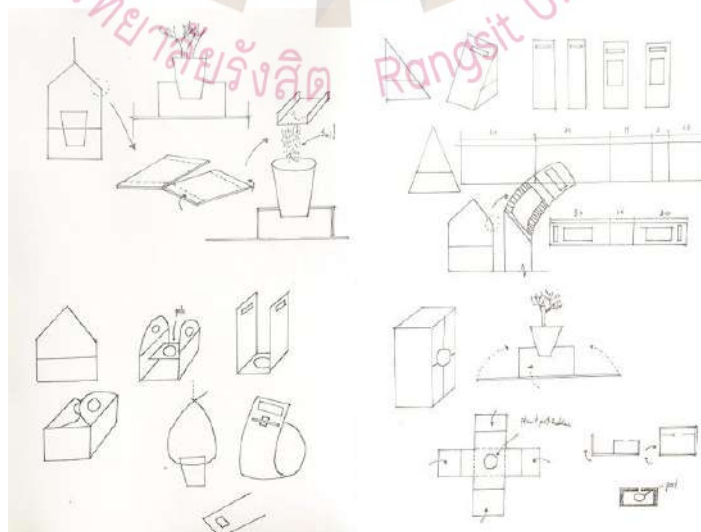


Figure 3.11 Design process of package

### 3.4.6 3D Model of package

It is a natural design. The material used is 100% natural to avoid environmental impact or air pollution. The design process is simple and can be done manually, which in the future it will also be able to decompose by itself over time.

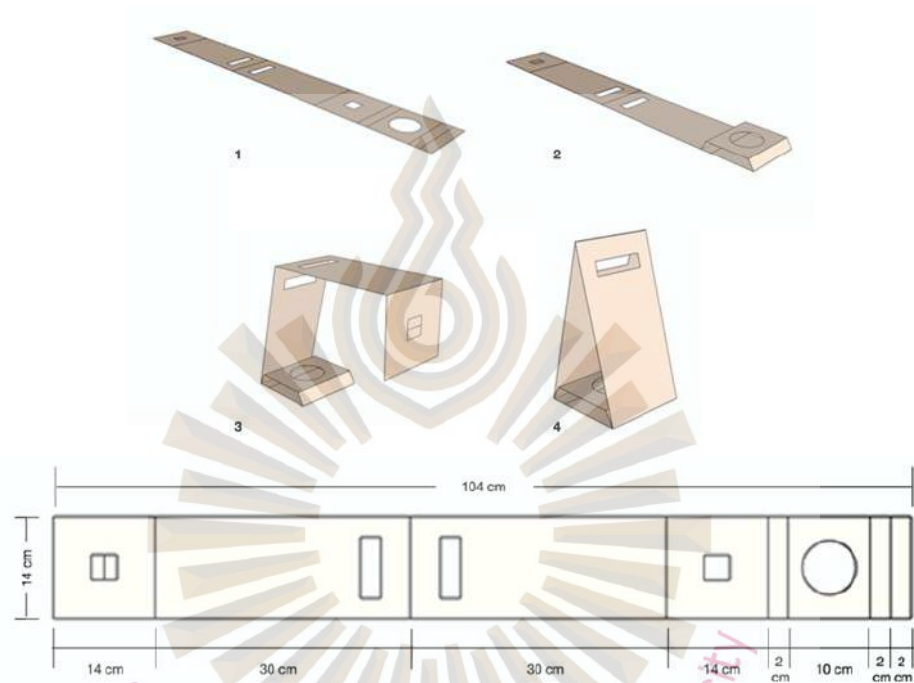


Figure 3.12 Package type 1

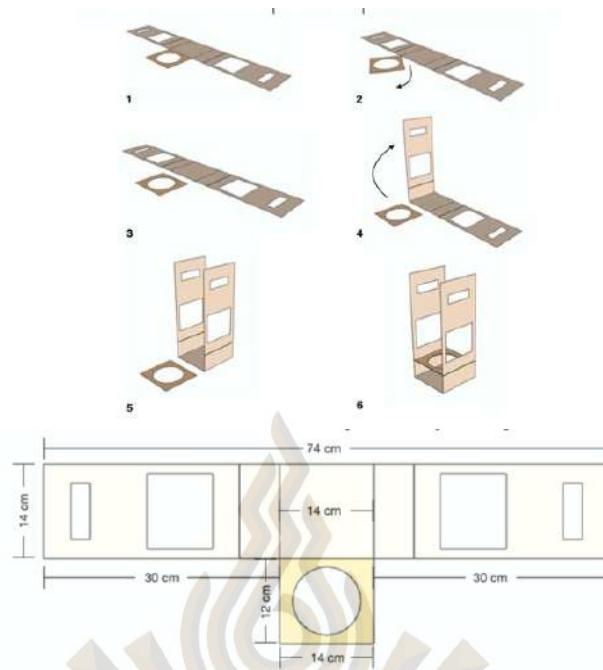


Figure 3.13 Package type 2

Use a simple origami technique that does not require much complexity and must be solid and withstand the weight of the material.

Logo design the author considers the tree growth cycle symbol of standing out and uses color to be involved, creating a new perspective born step by step in growth. The author's color story will use dark brown and green to indicate the state of being interpreted.

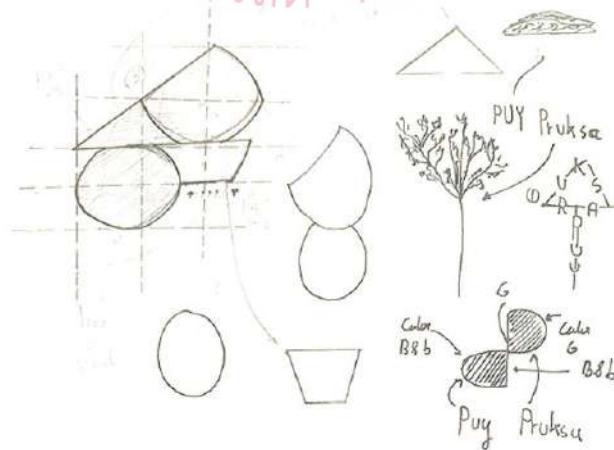


Figure 3.14 Design process of brand

I will get 2 alphabets, P, in vertical and upside-down format. The vertical is like a fertile, and I use the alphabet in green tones. The alphabet P upside down compares it to soil or fertilizer, making nutrients. Using the alphabet in dark brown tones, brand's name comes from the Thai name PUY, a substitute for fertilizer, and PRUKSA, a substitute for a tree. So, combine it with PUY PRUKSA.



Figure 3.15 Brand of products

Package and brand are other points that make customers interested. In accepting the use of natural materials, we all tend to overlook them. Which the package and the brand indicate the value of the product. I would like to present a new approach that can be adapted to be the most helpful and valuable. Because everything is a readily available material and people's demands increase with time.

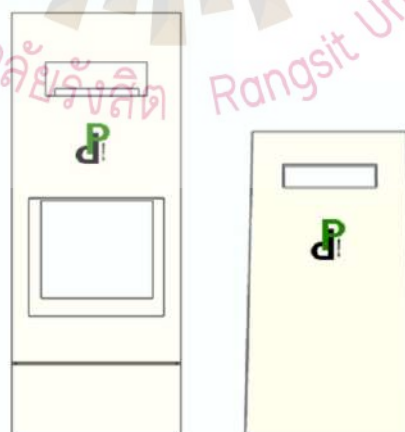


Figure 3.16 Package of products

## **Chapter 4**

### **Results and Discussion**

#### **4.1 Observation result and survey**

The results showed that in a village or community where there are a lot of large trees, people tend to pile the leaves and burn them themselves, or neighbors who plant trees tend to collect the leaves and burn them themselves, causing air pollution and a problem in the village or community. That often solves problems simply and easily, without considering the adverse effects in the future or nearby.

#### **4.2 Principals for Design**

Design thinking principles focus on transforming natural materials into market value and benefit the environment or community with resources and workforce. Including material problems, natural materials can be degraded by processes, but many factors affect many aspects. As well as large-scale problems that cannot be solved, such as forest fires and air pollution, directly affect humans and lead to the loss of resources and property.

#### **4.3 Design components**

This product is divided into two parts. Figure 4.1 is a natural fertilizer that uses readily available and most effective natural materials. The primary material used is leaves, and the secondary material is manure and coconut husk. To help support the leaves to decompose quickly and add minerals to the soil or the tree. Figure 4.2 is about making natural glue and the minerals the tree needs and adding minerals to it with fertile soil.





Figure 4.1 The primary material used to make natural fertilizers.

Leaves are naturally readily available and have fertilizing properties. Such properties must be coupled with the nutrients needed by plants and soil and optimize the whole environment, such as adding manure to increase microorganisms in decomposition or coconut husk to increase soil fertility, which directly affects plants.



Figure 4.2 Mineral and antifungal composition

Rice contains all the minerals needed by plants. Finger root is associated with a fungal disease caused by moisture that comes from rice. Both parts are essential to depend on each other. To form a natural glue along with minerals to promote plant growth.

#### 4.4 Detail and structure

Prepare the primary and secondary material elements to create a portfolio in the design direction. Considering the quality and benefits, there are 2 components to make up the work, and every element is vital to complete capacity.



Figure 4.3 Materials and processes for making natural fertilizers

Figure 4.3 shows the components section for the natural fertilizer process, divided into 3 sub-sections to increase the efficiency of natural fertilizers, benefit the environment, and reduce the root of the problem to a certain extent.



This essential sub-segments for making natural fertilizers, which are:

- 1) Leaves,
- 2) Coconut husk
- 3) Chicken & duck manure



Figure 4.4 Natural glue process



Figure 4.5 Natural glue

Figure 4.5 shows the components of natural glue making and total nutrients for plants. The components which are rice, and galingale rice contains nutrients that plants need. Kaempferia contains substances that prevent mold caused by moisture.

Sodium
Potassium
Calcium
Phosphorus
Magnesium
Iron
Zinc
Copper

Figure 4.6 It shows the nutrient components in rice that plants need.

#### 4.5 Usage

Figure 4.7 shows a picture of a tree sapling. Cultivation of saplings of trees is of utmost importance. If the plants do not have the proper minerals, they will rot or die. Figure shows the plants from a primitive but placed on a shelf, and this helps to save forecast and maintain good condition.



Figure 4.7 Sapling process, process of the last step

## 4.6 Final prototype

For the last step, I first started the natural glue process in preparation for the paper mache technique and then mixed it with the natural fertilizer that followed. We can mold any shape according to the basic design and add the appropriate decorations to make it exciting and attractive. Making a natural pot must emphasize the complete features of the plant, and the design or decoration can be adjusted as needed for the best beauty and quality. This model presents unique results suitable for customers who want to reduce their financial resources and help the environment. All details show the efficient use of resources in exchange for saving the environment and reducing the occurrence of many problems.



Figure 4.8 Prototype type 1



Figure 4.9 Prototype type 2



Figure 4.10 Final products



Figure 4.11 Products and brand package





## **Chapter 5**

### **Conclusion and Recommendations**

#### **5.1 Conclusion**

My study can be researching that by using natural materials and processing is something that everyone can handle and make for themselves. Because natural materials are not very complicated, it is important that we can help the environment in another way. The design must consider the benefits to plants and the environment to enhance the quality of the plants and reduce the root of the problem.

Picking up natural materials is the first step in helping the environment. 1) It reduces the waste that causes problems. 2) It helps to generate income for the community or itself through processing. 3) Saving the planet in the right way many factors can save the planet, this is another factor that can and has a positive impact. That is why this thesis is created as a base and inspiration for environmental conservation.

#### **5.2 Recommendations**

In this thesis, I need to redesign the package to attract more customers or users. Because now the product is too prominent by me showing the concept of biodegradable naturally. However, the package is biodegradable and can be modified in many ways. The package can be re-degradation in a more natural way that the attractive products can be reduced; various package design materials can be explored more in the future.



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