

# THE MENSWEAR BRANDING INNOVATION FROM ALGAE FIBRES INNOVATION FOR REUSE REVOLUTIONARIES TARGET GROUP BY USING ZERO WASTE CONCEPT

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## ABSTRACT

The menswear branding innovation from algae fibers innovation for reuse revolutionaries target group by using zero waste concept aims to give an added-value approach to algae agricultural wastes in shrimp farms to be an alternative innovation in the fashion industry which has been economically driven by the BCG model. Experimental and qualitative research methods with two procedures, that is to study related concepts and theories of material characteristics in step one and to give an experiment in product procedures in step two, were conducted in this research. From the study, it was found that algae can be naturally found in Phetchaburi Province Thailand's shrimp farms and mostly grows around brackish water areas. In some areas, this plant can be called Sarai Pomnhang, Gai, Tao or Thao, and its scientific name is *Microspora* sp. by the microscopic properties, it was found that filamentous unbranched, uniseriated, cells cylindrical, cell wall thick and stratified, cross wall H-shaped, chloroplast parietal and net-like appearance, which is similar to human hair. The fibers are also sticky and shiny, colored in light and dark green, and soft as wool so that fibers can adhere to themselves well. It grows well in shrimp farms with brackish water ecosystems by adhering to soil. To process algae fibers, it is necessary to wash, dry and fluff the fibers for easy spinning. and weaving mixed with cotton fibers. By three experiments on the ratio of algal fibers : cotton. The ratio 30:70 is that the fibers can bind so well that make textile strength. The ratio 50:50 is that the fibers bind to medium but can make the textile strength. The ratio 70:30 is that fibers are quite difficult to hold together and easily broken so the resulting textile has less strength. The properties of each ratio can be applied as alternative material in the fashion industry and lifestyle products differ according to suitability. For example, 30:70 is suitable for fashion and lifestyle products, 50:50 is suitable for lifestyle products, and 70:30 is suitable for decorative products. Algae fibers are therefore an alternative material that can be applied in the fashion industry and lifestyle products. The textiles not only add more value to agricultural waste, it is also used as local raw materials for maximum benefit without anything wasted, which corresponds to the BCG economic model that mainly focuses on design concepts for a sustainable environment.

**Keywords:** Alternative textiles, Innovation, BCG economy, Algae fibers

## INTRODUCTION

Pollution and shrimp farming problems in Phetchaburi Province generally affects the area's productivity including environmental deterioration, poor condition at the bottom of shrimp wells and poor water quality for shrimp growth. Those lead to various shrimp disease conditions. The amount of algae in shrimp fields also greatly affects shrimp farming (Narong Sang-in, 2022) Algae in shrimp farms are natural weeds with highly fibrous property. The plant has different names depending on the locality, such as Sarai Pomnhang, Gai, Tao or Thao. They are classified in Green Algae which is the largest seaweed group that can be found in any water areas — freshwater or saltwater. They are beneficial to increase oxygen in water because they can photosynthesize so that the plant is the first producer in the food chain. Algae are therefore necessary to the ecosystem (Yuvadee Peerapornphisarn, 2013) The characteristics of algae in shrimp farms are fibrous but tough with shiny, light green and dark colors. The fibers can stick together by themselves. The plant grows well in shrimp farms with brackish water ecosystems by adhering to the soil. Because of the rapid growth of algae, it has affected the shrimp farming occupation, and water quality. As shrimp ponds have too much algae, shrimp get stuck resulting in loss of productivity. In addition, when algae die, it results in excessive amounts of ammonia in water causing rotten smell and costs for disposal by scooping them up from the pond. This causes a large amount of solid waste. Shrimp farming careers also have blank periods affecting unemployment.

However, with the BCG economic model that is the concept of increasing efficiency from local agricultural raw materials to create maximum benefit without wasting, algae can be utilized and processed to have more advantages. The economic model-driven strategy is under the 3rd strategic plan on improving industrial development to be able to sustainably compete in both energy materials and biological chemistry. The action is to promote the introduction of excess agricultural products and waste material to create value-added that corresponds to the circular economy which combines technologies and innovations to create inventions and new services from reusing waste (Ministry of Higher Education, Science, Research and Innovation, 2021) The main objectives of the strategy are to conserve, restore, manage the utilization of biological and cultural resources to build more self-reliant capabilities under a sustainable environment.

Zero waste agriculture is a concept that has applied leftovers by adhering to the principle that “Waste is economically valuable and can be reused” and adhering to the goal that “To minimize waste and dispose of the remainder with effective technology”. Zero waste management is a new practice to change consumers' attitudes and behaviors to create awareness and cooperation. The conceptual framework is to minimize manufacturing and agricultural wastes to be environmentally friendly and be recycled as much as possible, especially some leftovers that are time consuming. and disposal costs (BANGKOKBANK SME, 2019) To reuse or recycle is a reduction in time burden and waste disposal costs. It also adds value by turning wastes into a material for environmentally friendly product design to make the most of it without anything being left.

From the study of experiments on processing algae in shrimp farms and its fibers under the research on the design of wall decoration products from Algae in shrimp fields, it was found that the fibers can be processed on making handicraft paper and extrusion with heat. With algae

properties — adhere to each other by themselves with strength, it can be designed as decorative products such as wall decors, lamps, partitions and types of lifestyle products such as notebooks, wrapping paper and flower wrappers, packaging containers, perfume diffuser and bags. However, there is still a lack of further development of innovative fibers to be applied in the textile and fashion apparel industry that can be an alternative and renewable materials that are environmentally friendly (Mongkol Ingkutanon, 2019). From the processing of algae in shrimp farms for use in design, the product has a unique identity. Algae give unique characteristics and properties especially in terms of environmental friendliness. In addition, consumers are nowadays paying great attention to the environment. Therefore, environmentally friendly products are becoming more popular. As a result, designers have been searching for more natural materials to use in their designs. Algae which is an eco-friendly material with fiber strength, toughness and self-adhesion are developed to be used as a textile material in fashion design that will help fashion products unique and respond to the needs of today's consumers (Noppadon Sangwanpetch, 2022).

It is consistent with the statement of Stella McCartney as the representative of the information and solutions to environmental problems arising from the clothing and textile industry to the UN conference on climate change. The statement was about the need to seek environmentally friendly raw materials called Low Carbon with low carbon emissions. In other words, people's attitudes have started to change, especially the people of Generation X, Y and Z. The fashion that causes environmental problems will never have a way to go on, and environmental conservation approaches will become the future of the fashion industry that will be a market gap to add value to waste materials. (PPTV Online, 2021)

In addition, Thailand has agricultural waste of up to 43 million tons per year with little use, and left in farmland or burned which is one of the causes of haze pollution. The Ministry of Agriculture and Cooperatives are aware of those problems and focus on farmers to make use of agricultural waste in order to reduce costs and add more value. This leads to a management of agricultural waste for the farm and community benefits, reducing the burning and promoting value-adding from agricultural wastes as production factors or biomass energy. It also reduces costs and adds value from agricultural waste instead of burning in farm areas which causes soil degradation causing dust and air pollution affecting human health and the environment (Samran Saraban, 2019)

As for the algae problems in shrimp farms, valueless weeds as agricultural by-products are in line with the BCG economic model-driven strategy that focuses on environmental creation with the concept of a design for a sustainable environment, corresponding with the market gap that creates value for waste materials. The development of algae fibers can be used in the design of lifestyle products. Initially, it could be processed into paper in handicrafts. The researcher spotted the fibers potentials and desires to develop innovation in the form of fashion textiles to add more value to this agricultural waste with the BCG economic model by designing menswear under the Zero Waste concept that responds to the needs of groups that want to make a positive impact on the environment (Reuse Revolutionaries)

### **Research Objectives**

1. To invent new creative products from agricultural waste, algae in shrimp farms to be an innovative alternative material in the present fashion industries corresponding to economic strategies driven by the BCG module.

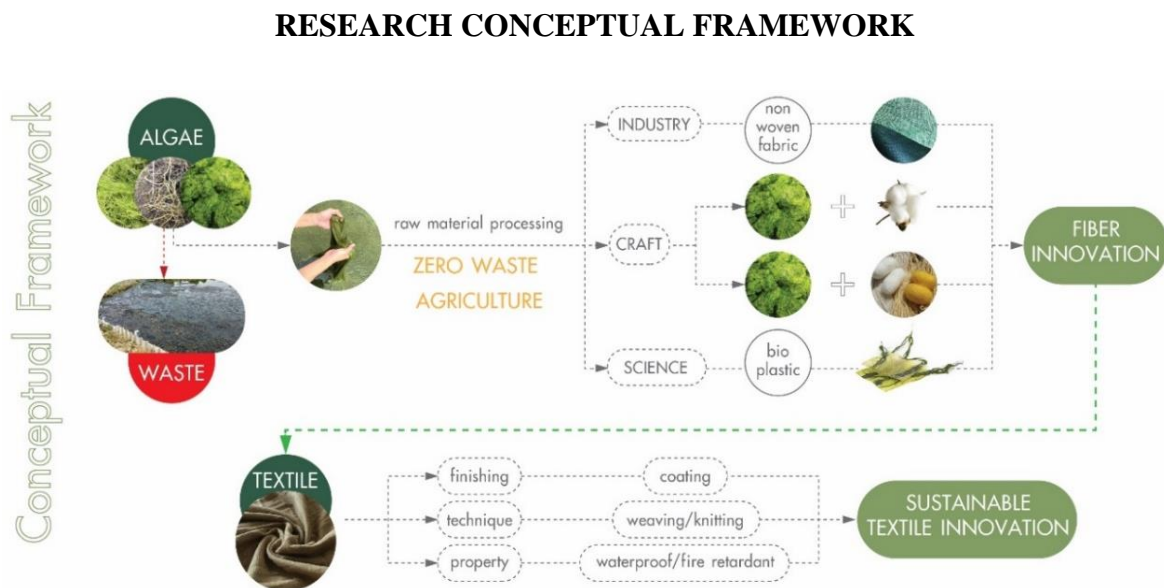
## Research Scope

### 1. Content Scope

- 1.1 To study information on the characteristics and properties of algae in shrimp farms.
- 1.2 To study the textile process made from natural fibers.

### 2. Area Scope

- 2.1 Shrimp pond area in Ban Laem District, Phetchaburi Province
- 2.2 Ban Tham Charoen Weavers Group at Tham Charoen Sub-district, So Phisai District, Bueng Kan



**Figure 1** shows the conceptual framework in the research.

Source: Picture by researcher, Mongkol Ingkuthanon

## RESEARCH METHODOLOGY

Qualitative research methods emphasized the study of features and properties of algae along with experimental research to process algae in shrimp farms into textiles for adding value. There were the steps as follows;

Step 1: A survey to collect data and data analysis

1.1 Spatial survey and qualitative data collection in terms of algae characteristics and properties by taking pictures and notes.

1.2 Studying the concept of designing to increase the efficiency from agricultural local raw materials to maximum benefit without anything left to waste (Zero Waste Agriculture), including textile design from natural fibers from relevant documents and research to analyze and conclude as a guideline for the experiment.

Step 2: An experiment on algae processing in shrimp farms

2.1 Preparation of algae for use as fibers in weaving

2.2 Weaving ratio experiment

## RESULTS

**Part 1** Spatial survey and collecting data on algae characteristics and properties in Bang Tabun-Ok Sub-district, Ban Laem District, Phetchaburi Province. It was found that there are 3 types of algae named by the locals as Sarai Pomnhang, Sarai Mama, or Sarai Wunsen, in shrimp farms. By the research, Sarai Pomnhang has the highest amount of fibers. This kind of algae is classified in the group of green algae which contains cellulose as component cell walls. When it dries, it sticks together in a sheet differ from Sarai Mama and Sarai Wunsen that shrinks and becomes crispy. In addition, it was found that this algae grows well in shrimp farms around brackish water ecosystems by adhering to the soil. The physical characteristics of algae in shrimp farms are fibrous, which is similar to human hair. Furthermore, The fibers are also sticky and shiny with light and dark green colors, soft as wool so that the seaweed fibers stick together very well.



**Figure 2** shows the characteristics of algae in shrimp farms

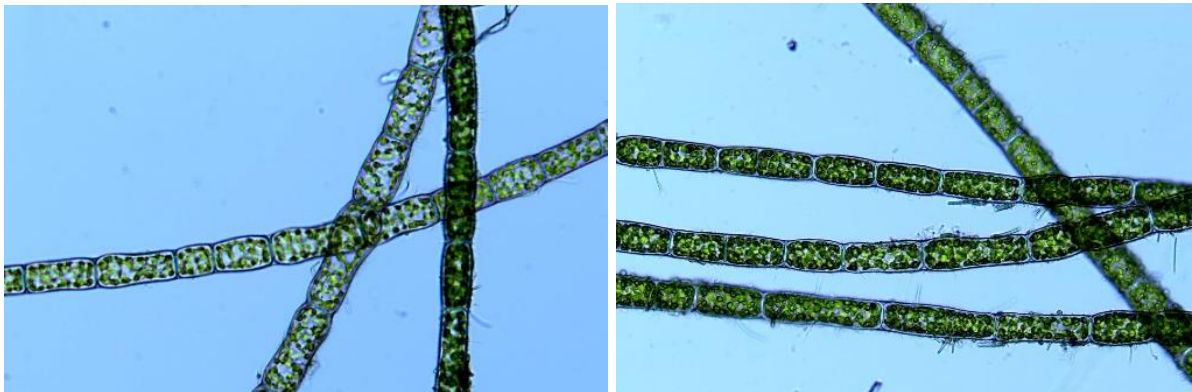
Source: Picture by researcher, Mongkol Ingkuthanon

**Table 1** The results for identifying the algae species

Habitat :	Running and standing water
Colour :	Natural colour : Green Cell colour : Green
Habit :	Attached algae
Microscopic features :	Filamentous unbranched, uniseriated, cells cylindrical, cell wall thick and stratified, Cross wall H-shaped, chloroplast parietal and net-like appearance In Thailand, the common name is "Sarai Kai".
Classification :	Division Chlorophyta Family Microsporaceae
Species :	17
Remark :	Used as food in the northern region around Mekong and Nan Rivers called "Kai Yee", "Kai Pan" etc.



From the above table, it was found that the scientific name of this algae is *Microspora* sp. in which cells are well-arranged in a single layer and form in a cylindrical shape with H shape. These plant cells, in addition, have mesh-shaped chloroplasts.



**Figure 3** shows the pictures of the species cells  
Source: Algal Excellent Center

**Part 2** An experiment on algae processing in shrimp farms

By the specific characteristics and properties of algae in shrimp farms, it can be processed into textiles with the concept of Zero Waste Agriculture as the following steps;

2.1 Preparation of algae for use as fibers in weaving. There are processes as follows;

- 1) Collect algae from shrimp ponds.
- 2) Wash with clean water 3-4 times, separating shellfish and soil.
- 3) Dry the seaweed by spreading it to prevent clumping.
- 4) Card the fibers by combing the fibers apart.
- 5) Mix the algae fibers with cotton.
- 6) Spun threads by handicraft process. The resulting yarn has the characteristics

shown in figure 5.






**Figure 4** shows the preparation of algae for use.  
Source: Picture by researcher, Mongkol Ingkuthanon



**Figure 5** shows the algae fibers spun with cotton  
 Source: Picture by researcher, Mongkol Ingkuthanon

2.2 The experiment of weaving algae fibers with cotton fibers in 3 ratios, 30:70, 50:50, 70:30, which can be summarized as Table 2.

**Table 2** The results of weaving experiments with the ratio of algae:cotton

Ratio Algae:Cotton	Picture	Results								
		Textile Strength			Thickness			Toughness		
		more	moderately	less	more	moderately	less	more	moderately	less
30:70		✓				✓				✓
50:50			✓		✓				✓	
70:30				✓	✓			✓		

From Table 2, it was found that fibers were able to hold together in the ratio of 30:70, making the fabric strong and not too thick. The resulting textile was soft, not stiff. With the ratio 50:50, the fibers can adhere to each other moderately, making the textile moderately strong. The fabric was thicker, and had a tougher surface than the ratio 1. The ratio 70:30, the fibers can hold together quite difficult making the textile break easily. The resulting fabric had less strength, thick and had a tougher surface than the ratio 2

### Conclusion and Discussion of Research Result

From the results of the study and experiment on the research The menswear branding innovation from algae fibers innovation for reuse revolutionaries target group by using zero waste concept, it can be summarized as follows;

1. Algae in shrimp farms, its fibers are sticky but soft as wool, are an alternative material that can be processed into textiles used in the manufacture of fashion industries and lifestyle products that cause interest. The textiles obtained are not only attractive and add more value to agricultural waste, it is also an application of the use of local natural resources for maximum benefit without anything wasted.



**Figure 6** shows the concept of adding value from agricultural waste.

Source: Picture by researcher, Mongkol Ingkuthanon

2. From the experiment of processing algae into textiles with a ratio of algae with cotton, each of which makes the textiles have different properties making them be applied as a new alternative material in the fashion industries and lifestyle products, such as 30:70 suitable for fashion industries and lifestyle products, 50:50 suitable for lifestyle products, and 70:30 suitable for decorative products. Algae in shrimp farms is therefore an alternative material that can be used in fashion apparel production and lifestyle products.

3. Textiles from algae in shrimp farms obtained from the research are in line with the creation and development of a brand from sustainable natural fiber textile innovation by Patcha U-Tiswannahkul (2020) who concluded that popular trends that domestic consumers and the international market are interested in sustainability. Environmentally friendly products for example, using natural fibers are designed based on sustainability corresponding to the strategic plan driven by the BCG economic module which mainly focuses on environmental sustainability.

### SUGGESTION

1. If algae can be processed in the industrial system, the fibers will be consistent and standardized, making textiles better commercialized.



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