

A vibrant assortment of fresh fruits and vegetables is displayed on a white surface. The collection includes clusters of purple and green grapes, several bright orange carrots, a large orange, a green cucumber, a red tomato, a purple eggplant, a red dragon fruit, a green cabbage, a yellow lemon, a green kiwi with a decorative white circular sticker, several red strawberries, a bunch of raspberries, and a string of red and dark red berries. A white text box with a thin blue border is centered over the image, containing the title in red and green text.

REDEFINING FOOD WASTE:
TRANSFORMING FOOD WASTE INTO
GARMENTS FOR A SUSTAINABLE UAE
FASHION INDUSTRY



Supervisor:
Prof. Andra-Camelia Clitan

Author:
Lma Saeed Shaibani

Institution:
Dubai Institute of Design and Innovation (DIDI)

Date:
09/05/2025

The background of the entire page is a close-up, high-angle shot of numerous thin, circular slices of lemons. The slices are arranged in a somewhat overlapping pattern, filling the frame. The color is a vibrant yellow, with the green rind visible at the edges of some slices. The lighting is bright and even, highlighting the texture of the lemon pulp and the veins of the rind.

ACKNOWLEDGEMENT

I would like to express my deepest appreciation and gratitude to my thesis advisor, Andra-Camelia Clitan, for her indispensable guidance, encouragement, and consistent support throughout this study. Her expertise and insights were instrumental in shaping the direction and success of this research.

I extend my exceptional thanks to the Dubai Institute of Design and Innovation (DIDI) for providing the platform and resources to explore this innovative concept at the intersection of fashion and food waste.

I am also deeply grateful to Barakat for their collaboration and generous supply of food waste materials, which were crucial to the realization of this project. Their partnership has been invaluable.

Finally, I would like to thank my family and peers for their unwavering encouragement, patience, and belief in me. Their support has been my strength throughout this journey.



ABSTRACT

This thesis investigates the perspective of transforming food waste such as fruits and vegetables residue into sustainable garments within the UAE. This is due to the significant contribution of the food and fashion industry to environmental problems. This study aims to help in the reduction of the problem by exploring how food waste can be repurposed into garments, and observes consumer perceptions through conducting surveys in order to understand the acceptance of the concept. The study aims to bridge the gap between food waste management and sustainable fashion.

CONTENTS

01

- 1.1 INTRODUCTION
- 1.2 STATEMENT OF THE PROBLEM & RESEARCH QUESTION
- 1.3 RESEARCH AIM AND OBJECTIVES
- 1.4 PURPOSE OF THE STUDY
- 1.5 SCOPE AND LIMITATIONS
- 1.7 CONCLUSION

03

- 3.1 INTRODUCTION
- 3.2 COLLECTION METHOD (Survey Method: Open ended/Close Ended Questionnaire)
- 3.3 ANALYSIS METHOD (*Content Analysis and Thematic Analysis*)
- 3.4 SURVEY ANALYSIS
- 3.5 OUTLINE OF Research Design PROCESS AND DIAGRAM
- 3.6 SURVEY ANALYSIS CONCLUSION
- 3.7 OUTLINE OF Research Design PROCESS AND DIAGRAM
- 3.8 GANTT CHART
- 3.9 METHODOLOGICAL LIMITATIONS
- 3.10 Ethical Considerations
- 3.11 CONCLUSION

02

- 2.1 INTRODUCTION
- 2.2 BASIC DEFINITIONS
- 2.3 HISTORICAL DEVELOPMENT
- 2.4 LITERATURE REVIEW AND CASE STUDIES
- 2.5 CONCLUSION

04

- 4.1 Barakat
- 4.2 Natural Fabrics
- 4.3 Natural Fabrics Characteristics List
- 4.4 Fabric Manipulation
- 4.5 Bio-Materials
- 4.6 Recipe Iteration
- 4.7 Color Samples
- 4.8 3D Printing
- 4.9 Conclusion

05

- 5.1 Photoshoot
- 5.2 Process Pictures
- 5.3 BIBLIOGRAPHY

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

1.2 STATEMENT OF THE PROBLEM AND RESEARCH QUESTION

1.3 RESEARCH AIM AND OBJECTIVES

1.4 PURPOSE OF THE STUDY

1.5 SCOPE AND LIMITATIONS

1.7 CONCLUSION

1.1 INTRODUCTION

As a fashion design student at DIDI, I chose to focus my research on modifying food waste and transforming it into sustainable garments. This thesis investigated the possibilities of utilizing fruits and vegetables residues in order to create sustainable garments.

1.2 STATEMENT OF THE PROBLEM AND RESEARCH QUESTION

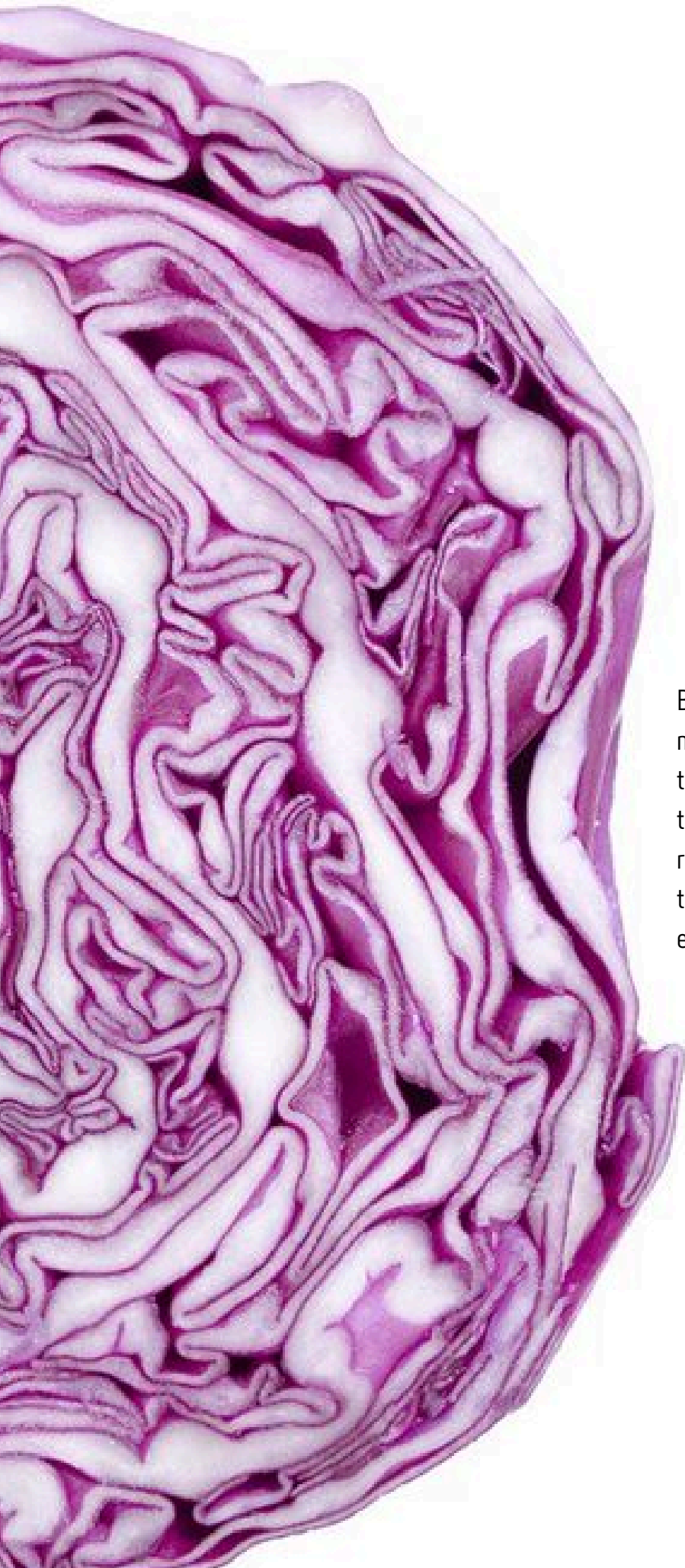
Food waste and unsustainable fashion are growing problems I am addressing. Significant amounts of food waste are generated in the UAE in addition to the pollution as a result of the fashion industry.

“To what extent does turning food waste into garments contribute to environmental sustainability in the UAE? ”

This question examines the extent of environmental benefits of reprocessing food waste and turning them into garments helps avoid environmental impacts.



1.3 RESEARCH AIM AND OBJECTIVES



Aim

Bridging the gap between food waste management and sustainable fashion is the aim of this study. The study seeks to investigate how food could be repurposed into garments contributing to the reduction of food waste and ensuring sustainable fashion practices..

1.4 PURPOSE OF THE STUDY

As a fashion design student at DIDI, I chose to focus my research on modifying food waste and transforming it into sustainable garments. This thesis investigated the possibilities of utilizing fruits and vegetables residues in order to create sustainable garments.



Objectives:



Experimenting and identifying suitable food waste for garment production by analyzing its properties.



Contribute to circular economy models development within the fashion industry by merging food waste and garment production.



Investigating consumer perceptions in the UAE and extent of acceptance of wearing a waste based garment by conducting surveys and exploring elements that influence their purchase decision.

1.1 INTRODUCTION



By bridging between the fashion industry and food industry, this thesis explores the potential of repurposing food waste into garments and contributing to food waste reduction providing a sustainable solution to the growing problem of food waste promoting national UAE based initiatives. In addition, the study investigates consumer perception towards sustainable fashion.



1.5 SCOPE AND LIMITATIONS

The scope of this thesis encompasses exploration of food waste as a raw material source as it highlights the potential of fruit and vegetable waste for garment production. A collaboration with Barakat, for a quantity of 2 kg twice a week would be offered as a material source. Moreover, contribution to environmental sustainability will take place by contributing to a circular economy and utilizing food waste contributing to food waste reduction in the UAE. Also, through the use of qualitative surveys targeting female consumers based in the UAE, a deeper insight into consumer perception and potential of acceptance could be investigated. Lastly, through this thesis new innovative, biodegradable materials would be made to contribute to a sustainable fashion industry.

On one hand, this research will encounter the limitations of sample size as most women across the UAE would not be able to take the survey. Material development constraints, as the process is time intensive and access to machinery is unavailable. Time limit is also a limitation as the thesis has a specific deadline and the material innovation process needs to be rushed through. Moreover, the surveys will only collect qualitative data and may include consumer biases as answering a survey is different from deciding to purchase a certain garment.

On the other hand, the delimitations of the study include the focus on utilizing food waste that is strictly provided by Barakat means limited fruits and vegetables would be provided. Moreover, the targeted market in the UAE means that the international market is not taken into consideration. Niche audience as the survey would only be done by women in the UAE aged between 20-50 would be a survey for a deeper view on consumer perception. The use of Qualitative research would be narrative-driven data rather than quantitative methods. Lastly, the time pressure and the short timeline would affect the depth of research and the number of explorations.



1.6 CONCLUSION

In conclusion, this thesis aims to investigate the potential of utilizing food waste in sustainable garment production and contributing to the circular economy within the UAE. The research scope has carefully been defined to concentrate on sustainable fashion.



CHAPTER 2

LITERATURE REVIEW AND CASE STUDIES

2.1 INTRODUCTION

2.2 BASIC DEFINITIONS

2.3 HISTORICAL DEVELOPMENT

2.4 LITERATURE REVIEW AND CASE STUDIES

2.5 CONCLUSION



LITERATURE REVIEW AND CASE STUDIES



2.1 INTRODUCTION

In the chapter, historical developments of fiber into textiles would briefly be stated, and it would be followed by literature reviews and case studies that gather information about the research done on different waste materials and the process of production and transformation from raw material into textiles.



2.2 BASIC DEFINITIONS

- Attitude-behavior: Is the term used to address consumer attitudes and purchasing behavior (Thanh and Hoang, 2019).
- Biodegradable materials: The ability of a material to decay without being harmful (Cambridge Dictionary, 2019a).
- Biopolymers: Protein and DNA are natural polymers, it refers to a molecule that creates a chemical substance (Cambridge Dictionary, n.d.).
- Cellulose: A substance located in the cell wall of a plant (Cambridge Dictionary, n.d.).
- Citrus peels: A label to plants that produce acidic juices such as oranges (Stenton et al., 2021).
- Composting: The process of collecting plant materials in order for it to decay (Cambridge Dictionary, 2023).
- Consumer: An individual that purchases goods or services for personal use (Cambridge Dictionary, 2023).
- Circular economy: It is a system where materials are never wasted through a circular approach (Ellen MacArthur Foundation, 2017).
- Dew retting: The process of placing plant stalks on the fields to extract moisture (Debnath, 2016a).
- Degradation: The process of something that is worsening in condition (Cambridge Dictionary, n.d.).
- Food loss: Is the waste arising from harvesting or distribution due to mishandling or poor infrastructure (Maryam Ali AlShamsi and Aljaradin, 2023).



- Food security: It is a fact that an area or a place is capable of obtaining or producing food quantities that feeds its population [Cambridge Dictionary, n.d.].
- Food waste: Refers to consumable food in good conditions that is unused or discarded at a consumer level. [Maryam Ali AlShamsi and Aljaradin, 2023].
- Greenhouse gasses: Trapped gasses in the atmosphere due to heat [United States Environmental Protection Agency, 2024].
- Lignocellulosic fibers: A set of natural plant-based fibers made of cellulose, lignin and hemicellulose [Samanta, Basak and Chattopadhyay, 2016].
- Water retting: A traditional process used to separate the fibers from the other plant components which involves soaking the plant in water, allowing the bacteria to break down the fibers [Debnath, 2016a].



2.3 HISTORICAL DEVELOPMENT

The utilization of plant-based fibers originates from ancient practices as flax, silk and cotton were the base of garment production. Dependency increased on petroleum as years passed and synthetic textiles were later produced. The industry saw potential in the flexibility and durability of synthetics and therefore, created a shift (Debnath, 2016b). However, natural fibers were replacements of some materials historically during war times due to material shortages, allowing them to be productive and reduce their dependence on imports. However, that same concept is reborn but from a sustainability aspect as waste and carbon footprints would be reduced (Stenton et al., 2021). In this thesis the utilization of organic peel would be used to contribute to modern day sustainability and the reduction of the consequences from the food and fashion industries.

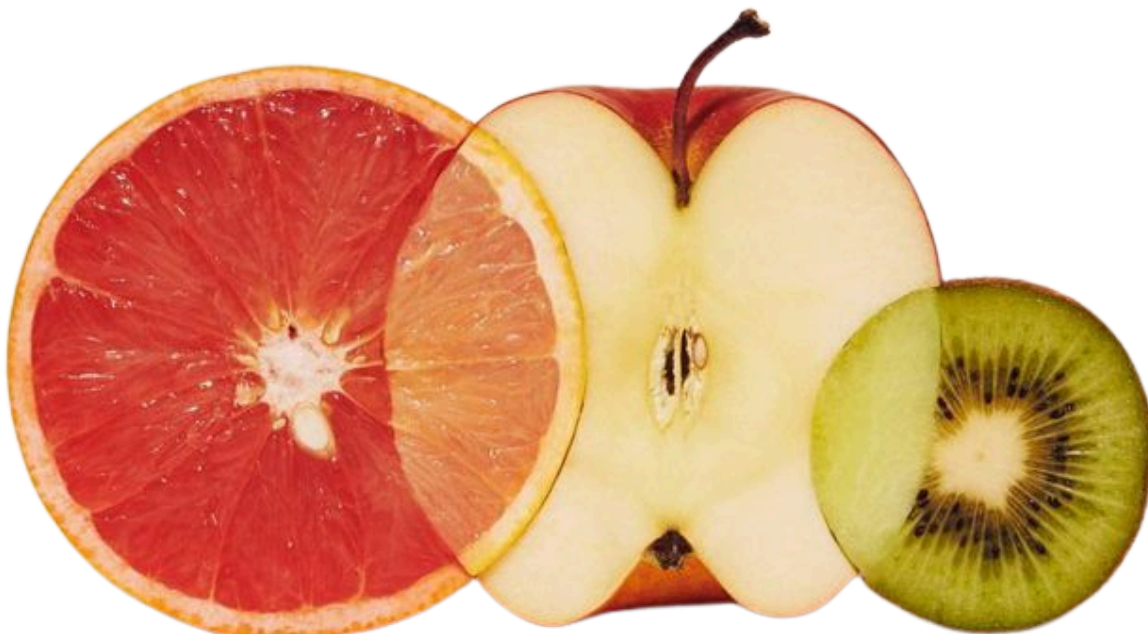


2.4 LITERATURE REVIEW AND CASE STUDIES

Food Waste

Food waste is a problem in the Middle East and North Africa (MENA) region. West Asian countries reported an estimation of 110 kg of food waste per capita yearly. The Food and Agriculture Organization (FAO) estimated that the MENA region will reach 250 kg per capita which is almost double the global average (Maryam Ali AlShamsi and Aljaradin, 2023). Food waste reduction is not just an environmental concern, but also an opportunity to improve food security, minimize financial loss and preserve energy and water (El Bilali and Ben Hassen, 2020). In this study Food waste in the UAE especially will be targeted.

A transformation from an economically undeveloped country into one of the top wealthiest countries within the Middle East, the United Arab Emirates (UAE) provides residents of the country with a higher quality of life. However, even though a rapid economic growth and social development took place, the UAE is persistently confronting food waste (W F). Around 12% of the UAE's total annual food supply is wasted which is equivalent to 13 billion AED (\$3.5 billion) (Lamba, 2021). Food is a crucial component for humans to survive, providing them with the required nutrients, energy and contributes to cultural identities. Food waste occurs in a variety of stages, from farms to end consumers. This could be for multiple reasons which include spoilage, unsuitable storage, vermin infestations, discarding edible parts. The hospitality sector such as hotels and resorts in the UAE contribute significantly to food waste due to overproduction and the demand for plentiful food choices (Maryam Ali AlShamsi and Aljaradin, 2023). Addressing and apportioning food waste from different perspectives is key to sustainability as it covers three sustainability pillars: social, economic, and environmental. In 2015, the United Nations (UN) introduced 17 Sustainable Development Goals (SDGs) promoting sustainable global practices. SDG 12 "responsible consumption and production" and its been stated that the UN will focus on halving the food loss and food waste should take place in 2030. Therefore, the UAE launched multiple initiatives within the UAE including "Zero Hunger 2051" pushing towards sustainable food management systems where food waste is taken to food banks and later used for different outputs (Reham Zeyad Sadeh and Bassam Abu Hijleh, 2024). Recent studies show that UAE households produce around 224 kg of food waste per capita annually with a 40% domestic waste incorporating unwanted food (Yagoub et al., 2022). Abu Dhabi and Dubai have a food waste output of an estimated 12.84 million tons annually (Osail et al., 2022). As the UAE hosted the COP 28, the food waste problem is getting highlighted internationally emphasizing the importance of innovative solutions (Kennedy et al., 2024). Food waste ends up in landfills contributing to greenhouse gasses and other environmental problems (Provin et al., 2021). Therefore, this thesis aims to utilize the waste in collaboration with Barakat, a well known brand in the UAE for fresh fruits and drinks, Barakat waste will be repurpose into garments.



Fashion Industry

The fashion industry is a significant contributor to pollution due to consequential textile waste, major chemical and resource use. By merging food waste and fashion industries, the environmental footprint would be reduced. The production of biotextiles aspires to a transition into sustainable fashion, reducing its commitment to global concerns such as pollution (Provin et al., 2021). An estimation of 10% of global greenhouse gas emissions is due to the fashion industry, and also contributes to an estimation of 20% water pollution. This is a result of fast fashion and the short life cycle of garments that are disposed of in significant quantities into landfills (Stenton et al., 2021). Many synthetic fabrics contribute significantly to environmental damage for extensive chemical and water use for polyester production (Brătianu et al., 2021). The food and fashion industry may seem unrelated but they are interconnected as both industries contribute to serious environmental concerns. Both industries are investigating how they could contribute to sustainability (Brătianu et al., 2021). In this thesis, the materials used would be 100% natural materials such as linen and cotton, in combination with the use of biomaterials and food waste for a biodegradable garment that has minimal harm on the environment.



Exploring Plants Fibers

Fiber from plants known as "Lignocellulosic fibers" is extracted as it embeds properties such as strength, biodegradability and renewability. One of the affordable fibers is jute, jute is blended with different fibers to control its properties. Jute has been used in fashion for high end garments, bags and upholstery. The study states that when blending jute with cotton or ramie, softness, and flexibility are increased which allows products and garments to be functional (Samanta, Basak and Chattopadhyay, 2016).

Apple peel, wine waste, piñatex which is the pineapple leaves and citrus peels which is driven from orange fiber are being processed and made into leather alternatives (Stenton et al., 2021). Natural fibers such as ramie, jute, banana fibers and hemp are used as bio-mordants and organic dyes, reducing the impact of the chemicals from the fashion industry on environmental degradation (Samanta, Basak and Chattopadhyay, 2016).

Most of the research was to explore jute more, Jute is extracted from Lignocellulosic fiber and it is one of the affordable fibers. Jute is blended with different fibers to control its properties. Jute has been used in fashion for high end garments, bags, jackets, shawls and upholstery. The study states that when blending jute with cotton or ramie, softness, and flexibility are increased which allows products and garments to be functional (Samanta, Basak and Chattopadhyay, 2016).



Study shows that the fibers listed below are under investigation and experimentation [Debnath, 2016b].

- Ramie: It is commonly used in Chinese textile, ramie is extracted from the *Boehmeria nivea* plant that is known for strength and durability with strong potential for high-end fashion [Debnath, 2016b].
- Sunn Hemp: It is a plant based fiber, suitable to blend with other materials, and its main property is durability as durable yarn could be processed from sunn hemp [Debnath, 2016b].
- Nettle: It is a plant based fiber that is short however, it is generally blended with other fibers providing textiles with unique textures [Debnath, 2016b].
- Coir: It is coconut fiber extracted from coconut husk due to strength and durability properties. It is commonly use for floor mats and decorative items [Debnath, 2016b].





Natural fibers are facing struggles due to limited research and high extraction costs. The study shows that it is essential for nettle and ramie to go through complex degumming processes. Moreover, it is required for banana and pineapple fibers to be blended with other fibers for durability maximization (Debnath, 2016b).

An estimation of 8.3 million metric tons of pineapple of food waste takes place in Portugal. Therefore researchers invested into exploring ananas comosus, ananas comosus is used to extract pineapple leaf fiber as a sustainable substitute to traditional textiles. Massive quantities of biomass from the pineapple plant is contributing to food waste. Therefore, transforming pineapple plant biomass into fibers is a solution to the reduction of food waste while producing luxury textiles. The study states that researchers investigated and experimented with fiber extraction methods, and the successful method was blending pineapple fiber with jute and cotton as due to the increase of properties such as softness and durability. The unique properties with pineapple fiber textiles is soft and creamier due to moderate cellulose and low lignin concentration. Chemical treatments such as acetylation and alkali improve pineapple fiber hydrophobicity and thermal stability (Debnath, 2015).



Nadine Lustre backstage at BYS Fashion Week in Piña Fabric
(Yap, 2024)

Pineapple fiber is known as "Piña Fabric", and it is commonly produced in the Philippines. It is processed through weaving or spinning techniques while being blended with cotton or jute to improve texture, weight and durability. The blends of pineapple fabric with other materials depends on the use. Moreover, Piña Fabric is now used in sustainable luxury brands (Debnath, 2015). The materials would be determined at the exploration stage as experimentation is key for a successful output.

Production Process

Food waste could be repurposed in the production of textiles or biopolymers in a variety of methods, some methods may include extracting cellulose from fruits and vegetables such as utilizing pineapple leaves waste to create leather alternatives for high end fashion. Another example may include onion skin where it is precious as a natural source of dye and is UV-protective and antibacterial. Sustainable fashion depends on sustainable innovative materials.

General process of turning waste into sustainable fashion is as follows: Food waste needs to be collected and treated by removing impurities and extracting compounds. Then the processed until a biopolymer starts to form from which it is later molded and dyed. As a finishing method materials are treated which helps them enhance their properties including material durability. Finally the assembly of the garment or the product takes place and for future disposal, the garment is later biodegradable (Provin et al., 2021).

However there is a more detailed process to it, there are 2 ways where fibers could be extracted, manually or through mechanical processes. On one hand, the manual method of fiber extraction oftenly employs a scrapper as it provides finer fiber; however, production volumes are low. On the other hand, mechanical production is used for mass volumes and the process includes placing the leaves or the fruit or vegetable peel onto a conveyor belt that undergoes multiple processes including removing the waxy coating, splitting zones and scrapping. It was evident in comparative studies that although mechanical extraction was time effective but manual methods conserve a higher quality advantage. Fiber undergo retting and degumming post extraction to enhance their qualities (Debnath, 2015).

The end life aspect of sustainable materials is compostability and biodegradability ensuring that the materials produced return its nutrients to the soil, reducing short term pollution and long term waste (Stenton et al., 2021). The full potential of natural fibers is not yet investigated. Processing nettle, jute and ramie are labor intensive. Moreover, techniques such as enzymatic retting could be applied on bast fibers such as hemp, jute and flax where enzymes are broken into binding compounds such as pectin causing no damage to the fibers. Another alternative method would be water retting, which submerged plant stalks such as hemp and flax in rivers or pond in order for the microorganisms and the bacteria to break binding compounds as it is left for several days, after several days or weeks as it depends on the type of fiber the fiber is loosen up and could be separated with ease from the woody core. However, this could cause water pollution if it is not managed with care. The last method would be dew retting where plant stalks are placed on the fields to extract the moisture speeding microbial activity of breaking binding compounds. Dew retting relies on humidity and temperature as it controls the speed of the process (Debnath, 2016a). Due to financial limitations, in this thesis experimentation with manually extraction techniques would be applied and analyzed.



Circular Economy

Circular economy focuses on replacing conventional “take-make-dispose” models by integrating sustainable systems where material lifecycle is maximized and waste is minimized. This paper highlights the merge of the textile and the food industry where it suggests repurposing food waste into biotextiles due to sustainability. Cross-industry approach promotes innovative solutions (Provin et al., 2021). Promoting circular economies and slow fashion would play a significant role in restructuring the future of fashion allowing it to embrace environmental consciousness (Stenton et al., 2021). This thesis contributes significantly to the circular economy as Barakat waste would be provided with a new life as it is repurposed into garments.



Challenges Of Sustainable Fashion

Sustainable fashion is facing practical and conceptual challenges. The fashion industry lacks consensus over the definition of sustainability and the study highlights this. Participants' definitions varied between a garment lifecycle and the use of eco-friendly materials, revealing the complexity of the concept and lack of standardization suggesting the necessity of clear guidelines that the industry could follow to have an effective step towards sustainability (Hur and Cassidy, 2019). Production cost should be reduced in order for the wide availability of sustainable materials. Decreasing dependence on expensive raw materials allows feasibility for upscaling production and prompts global waste reduction (Provin et al., 2021). In this thesis, during the experimentation phase, a criteria list would be created to make sure that the end material would be the one with the most important properties for functionality and aesthetics.



Consumer Demand

Increased consumer demand would guide the investment of research into unexplored fibers, which may be an evolution to the redefinition of high end fashion (Debnath, 2016b). By collaborating and partnering with restaurants and food companies, fashion brands would be able to meet consumer demand while committing to global environmental goals by repurposing agro-waste into high-quality textiles (Brătianu et al., 2021). This thesis would conduct qualitative surveys in order to get a deeper insight about female consumers living in the UAE and their opinion and concerns on the concept.

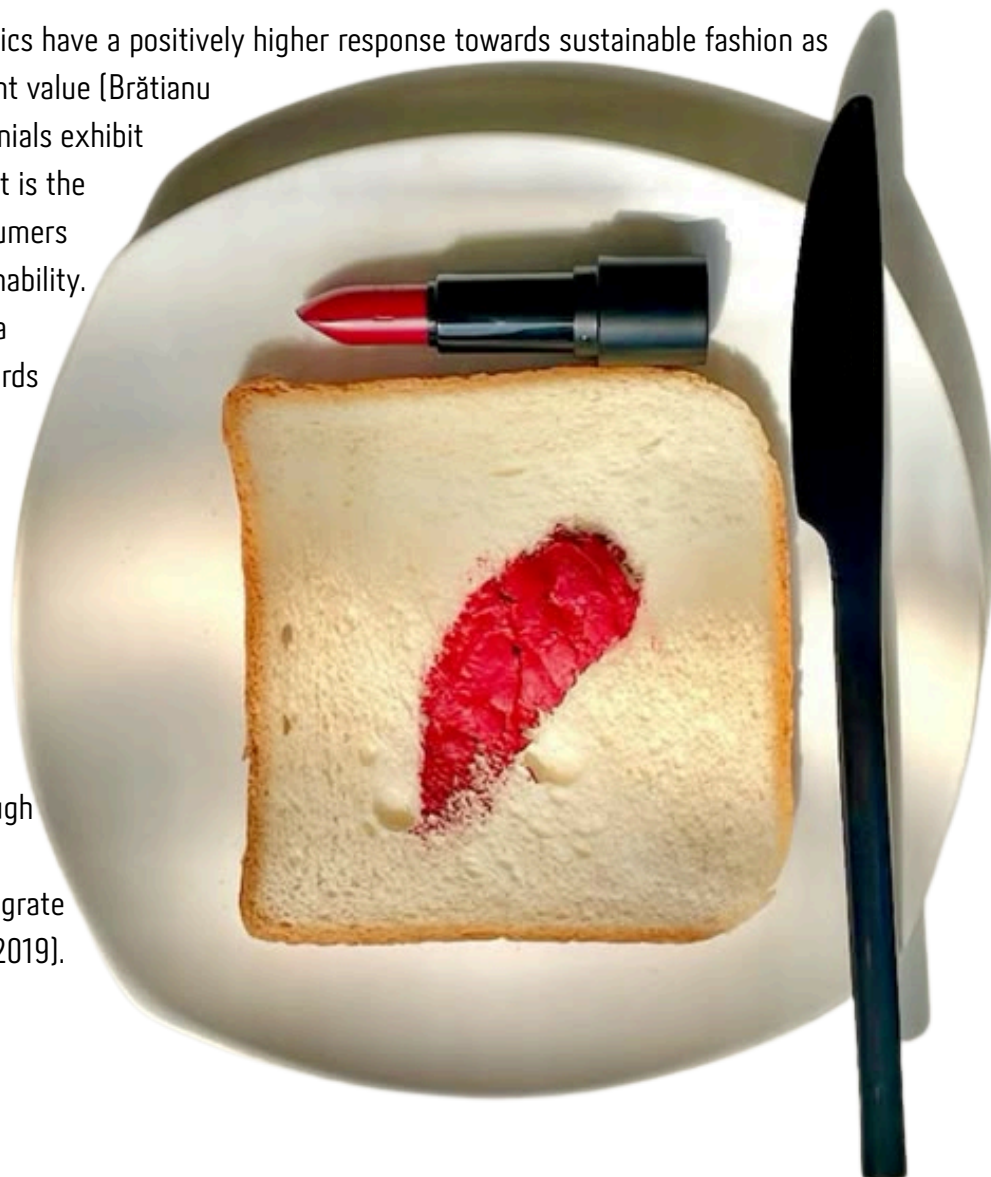


Consumer Behaviour

Consumer behavior and perception towards sustainable fashion is extremely complex as demographics and psychology are influential factors [Thanh and Hoang, 2019]. "Attitude behavior gap" is the term used to address consumer attitudes and purchasing behavior. There is a gap in consumer interest and purchasing behaviors when it comes to sustainability. Although many consumers are aware of the environmental impact and they express their desire for suitable sustainable shifts, however, this does not result consistently in purchasing eco-consciously. The study states that consumers are skeptical of "sustainable" and "ethical" labels. This is due to the lack of transparency and trustworthiness of information. Many consumers doubt the extent of sustainability brands claim. Adding on, sustainable garments are viewed as expensive therefore, less accessible unlike fast fashion. Sustainable fashion marketing often fails to align with consumers' shopping habits and preferences. The study suggests that besides the economical limitation for customers, sustainable options lack a variety of styles and sizes leading consumers to behavioral disconnect. This gap is an opportunity provided for fashion brands to pioneer in price ranges and styles in a sustainable way while maintaining transparency. By identifying and understanding consumer perception companies could cater better to consumer values followed by the action of actual purchasing behaviors [Hur and Cassidy, 2019]. As stated earlier many consumers prioritize cost and aesthetics over sustainable purchases. This challenges the industry to be price sensitive especially when consumers compare sustainable garments prices to fast fashion [Thanh and Hoang, 2019].

Recent studies suggest that younger demographics have a positively higher response towards sustainable fashion as they are aware of the sustainable fashion garment value [Brătianu et al., 2021]. Younger generations such as millennials exhibit inclination towards sustainability studies say as it is the demographic with the most eco-conscious consumers that are willing to pay more as they value sustainability. Marketing especially through social media plays a huge role in shifting consumers' perception towards sustainable fashion as it needs to align with the consumers values and this was successful on millennials [Thanh and Hoang, 2019].

It has also been found that there is a real lack of awareness among designers the study reveals. Designers are unaware of existing sustainable tools such as Eco-Indicator and Life Cycle Analysis tools that would guide them through sustainability. 30% of the surveyed participants experienced such tools and less participants integrate those tools into their designs [Hur and Cassidy, 2019].





Industry Shift

A transition towards sustainable sourcing has increased in the last few years due to the increased shift of ethical products demand by consumers. The dependence of the fashion industry towards low-wage countries for sourcing is shifting slowly to sustainable sourcing. Transparency is the standard expectation from companies, it is becoming a norm for sustainable companies to provide transparency while adopting sustainability as a concept. The transparency should be visible through supply chains, procurement policies and listing restricted substance lists (Matthes et al., 2021).

Therefore, Sustainable sourcing does not only aim to decrease environmental impacts but also aims to cater consumers with ethically produced garments (Matthes et al., 2021). This thesis would provide high transparency and would walk the reader through details of the process until a successful material is produced.



Case Study: The Ecological Turn

An intersection between food waste and sustainable fashion industries has taken place as both industries are addressing environmental concerns. A rapidly growing number of companies and designers are exploring ways to repurpose food waste into garment production to contribute to the circular economy as it aligns with the cradle-to-cradle approach from biomimicry principles. Italian companies such as Frumat and Grado Zero commit to such innovative projects as their work highlights how food waste could be utilized in fashion (Program et al., 2016).

Turning food waste into sustainable fabrics proposes several ideas on thinkers such as Tony Fry and Donna Haraway. Tony Fry pushes for the formation of partnerships and merging ways of thinking as his approach is “redirective practice”. Donna Haraway’s approach is “making kin” which is forming meaningful new connections through interdisciplinary fields. A well known fashion scholar Alice Payne built on the concept of “futuring” which suggests that the fashion industry should move from a cradle to grave approach to a cradle to cradle and reuse of resources. Apple residues and *Phellinus ellipsoideus* mushrooms are utilized as raw materials for fabric production, reducing reliance on synthetics. This case study analyzes how food could be a crucial resource for the fashion industry (Program et al., 2016).



[Commonshare, 2023]

In Italy, Trentino, Frumat is an innovative company specializing in developing sustainable materials made from food waste. One of their innovative products is “Apple Skin” and an alternative for leather. Apple skin is made of apple waste and particularly the apple cores and skins that are discarded. Frumat provides a new life to apple residue by transforming it into vegan leather. This offers a sustainable textile that meets the rising demand for sustainable fashion. Apple skin is well known for properties such as breathability, texture, and environmental benefits. **Womsh** is a footwear brand that commits to sustainability goals as they produce vegan shoe collections from apple skin. A collaboration between Frumat and **Womsh** reduced food waste impact in the environment while catering consumer demand with high-quality textiles. Moreover, Frumat and **Womsh** follow a circular approach where waste is not an end product but a valuable raw material, reshaping the fashion industry’s future (Program et al., 2016).

In Italy, Trentino, Frumat is an innovative company specializing in developing sustainable materials made from food waste. One of their innovative products is "Apple Skin" and an alternative for leather. Apple skin is made of apple waste and particularly the apple cores and skins that are discarded. Frumat provides a new life to apple residue by transforming it into vegan leather. This offers a sustainable textile that meets the rising demand for sustainable fashion. Apple skin is well known for properties such as breathability, texture, and environmental benefits. Womsh is a footwear brand that commits to sustainability goals as they produce vegan shoe collections from apple skin. A collaboration between Frumat and Womsh reduced food waste impact in the environment while catering consumer demand with high-quality textiles. Moreover, Frumat and Womsh follow a circular approach where waste is not an end product but a valuable raw material, reshaping the fashion industry's future (Program et al., 2016).



(Bianucci, 2023)

In Italy, Tuscany, a research driven company Grado Zero is dedicated to innovate and explore sustainable materials that could be used for garment production. Grado Zero had remarkable projects for textiles, such as the leather alternative called "Muskin" made of *Phellinus ellipsoideus* mushroom. Muskin is made of fungi instead of animal skin and it is entirely biodegradable. As well as, the production process contains toxic chemicals which makes it safer for the environment and consumers. Muskin is known for its similar texture to suede, it is extremely soft, and has excellent water resistance properties. It is used in fashion, interior and in accessories designing due to its properties that called the attention of brand and designers looking forward to be sustainable. Muskin is gaining popularity increasing the market demand for eco-friendly consumers. As Grado Zero focuses on innovating biomaterials and sustainable textiles, it mirrors a crucial shift towards a sustainable fashion industry offering a direction for designers and researchers to explore (Program et al., 2016).

Despite the success in research for coming up with those innovative sustainable materials, challenges such as high production costs are a problem due to limited economies. Moreover, the lack of standardization of the processes complicates the consistency of materials (Program et al., 2016).

Furthermore, to address the identified challenges, the fashion industry must invest into more research and technological advancement that could be used for mass production. Adding on, more consumers should be educated about end-of-life disposal and the consequences such as environmental degradation and the available alternative materials. Moreover, governments must launch initiatives for sustainable production and consumption (Program et al., 2016).

Case Study: Textiles from orange peel waste

Around 51.8 million annual metric tons of oranges are produced globally due to high consumption demand. This results in the waste of the orange peel especially in juice and food processing industries. Landfills are annually filled with an estimation of 15–25 million tons of orange peels, causing spread of disease risks, microbial infestations and foul odors. This significant amount of orange waste provides industries and especially the textile industry with an opportunity to explore the potential of repurposing orange peel (Sachidhanandham, 2020).



[Orange Fiber, 2021]

Karolina Kurkova in Italy at Green Carpet Fashion Awards in 2017.

In 2012, an Italian designer, Adriana Santanocito investigated the potential of orange peel waste as a material source for textiles through an innovative project. This project originates from Santanocito's concern about the environmental impact that is caused by the juice industry. Millions of tons of orange peels are disposed of every year, piling up and contributing to the release of toxic greenhouse gasses. Santanocito took this as an opportunity to purpose organic waste to sustainable textiles through extensive research. Through her research she was exploring ways to isolate cellulose which is a compound found in plate based materials that could ease its transformation into fiber. As she experimented with different extraction techniques, Santanocito discovered a technique to transform orange peel into cellulose-rich pulp. Later the pulp is spun into yarn and used for weaving or knitting. Blending orange fiber with cotton or silk provides her textiles with soft, silking high-end qualities of textiles that are suitable for a luxurious appearance. Orange Fiber markets cream-colored satin, lace silk and viscose-like material. The finding and success of this method led to the creation of her brand "Orange Fibre" with the vision of transforming waste into premium textiles. Her work grabbed the attention of eco-conscious designers and consumers and the brand is gaining rapid recognition within the sustainable fashion industry as they pioneer through innovating new textiles contributing to circular economies. "Orange Fibre" by Santanocito highlights the modern innovation within the fashion industry and represents a successful alignment between contributing to environmental goals while setting standards for an eco-friendly luxury fashion industry (Sachidhanandham, 2020).



[Trimarchi, 2017]

H&M collaboration with Orange Fiber in 2015. Salvatore Ferragamo collaboration with Orange Fiber in 2017 on 47th Earth Day.

In 2019 H&M launched a collection using Orange Fiber textiles, supporting the sustainable consumer demand. Moreover, Orange Fiber textiles have been shown at Salvatore Ferragamo collection in 2017. The advancement in demand for Orange Fiber and the growing demand for orange peel textiles portrays the growing potential of the success of the fashion industry. Other agricultural wastes are under ongoing research for different industries such as paper production, and for supercapacitor replacement as this approach contributes to circular economy and supports the global sustainability goals by converting waste into raw materials addressing a crucially positive environmental shift (Sachidhanandham, 2020).



[Trimarchi, 2017]

H&M collaboration with Orange Fiber in 2015. Salvatore Ferragamo collaboration with Orange Fiber in 2017 on 47th Earth Day.

2.5 CONCLUSION

A universal solution to food waste is still unapplicable, therefore each industry could contribute to sustainability and food waste reduction through different methods. In the fashion industry in collaboration with the food industry, food could be utilized for the creation of garments, integrating food waste into a closed loop system where it is not harming the environment. Waste is gathered and processed in certain ways whether its manual or by machinery the

METHODOLOGY

3.1 INTRODUCTION

3.2 COLLECTION METHOD (SURVEY METHOD: OPEN ENDED/CLOSE ENDED QUESTIONNAIRE)

3.3 ANALYSIS METHOD (CONTENT ANALYSIS AND THEMATIC ANALYSIS)

3.4 SURVEY ANALYSIS

3.5 OUTLINE OF RESEARCH DESIGN PROCESS AND DIAGRAM

3.6 SURVEY ANALYSIS CONCLUSION

3.7 OUTLINE OF RESEARCH DESIGN PROCESS AND DIAGRAM

3.8 GANTT CHART

3.9 METHODOLOGICAL LIMITATIONS

3.10 ETHICAL CONSIDERATIONS

3.11 CONCLUSION

3.1 INTRODUCTION

The proposed research is situated both theoretically and methodically within the fields of sustainable fashion and food waste. Based on the findings of the literature review and case studies presented earlier, the proposed research will espouse a mixed method approach for gathering and analysing data. According to Sharon Andrew and Elizabeth Halcomb's book *Mixed Methods Research for Nursing and Health Sciences* (2009), a mixed method research is "a systematic approach to addressing research questions that involve collecting, analysing and synthesizing both quantitative and qualitative data in a single research project." (Sharon, 2009, p. vi). On the one hand, the research will depend on the quantitative data presented through secondary sources, or the case studies already analysed in Chapter 1. On the other, the research will collect and analyse qualitative data from open ended/close ended questionnaires that will be later analysed using content/thematic analysis methods.



3.2 COLLECTION METHOD

(Survey Method: Open ended/Close Ended Questionnaire)

3.2.1 General Background

This study focuses on analysing consumer perception which would help the technical variability of producing food waste based garments underlining the potential market acceptance. By using open-ended and closed-ended questions, a deeper understanding of female consumers' perception would be noted.



3.2.2 Benefits

- Deeper Insight: A qualitative study on consumer perception towards food waste as garments, the highlight is understanding consumer concerns and opinions. Using open-ended questions allows the investigation of respondents' concerns and opinions in detail, enabling the study to gain a deeper insight.
- Setting Context: Closed-ended questions will be used before diving into open-ended questions, to add context and clarify particular aspects.
- Basic Information: In closed-ended questions basic information would be collected as it could add background information for the open-ended responses. Close-ended information may include demographic data, nationality and age.
- Free Expression: Close-ended questions may include "yes/no" questions and would be followed by an open-ended question such as "Why?" allowing the respondents to freely express and explain their opinions which would help achieve the listed objective (Purandare and Patil, 2023).



3.2.3 Process

1. Designing the Survey

- Defining Objectives: Determine what information needs to be extracted from female consumers.
- Balanced Clear Questions: Develop a combination of open-ended and closed-ended direct clear questions.

2. Data Collection

- Survey Distribution: Females across the UAE from ages 15 - 60 will be surveyed and responses collection will be in a digital and a physical format.

3. Data Segmentation And Analysis

- Closed-Ended Questions: The closed-ended responses are simply quantifiable and it would be easier to track how many respondents are accepting the food waste into garments concept and how many respondents are familiar with it.
- Open-Ended Questions: Richer in information but unstructured data that requires coding and categorizing based on key themes identified to provide a deeper insight into respondents perception and revealing concerns. Grouping responses that are similar into categories while identifying and observing patterns to draw conclusions (Purandare and Patil, 2023).



3.2.4 Limitations

- **Time Consuming:** If respondents are not deeply engaged with food waste or sustainability, respondents may feel like open-ended questions are difficult or protracted, leading to a reduction in the quality of data due to superficial or incomplete responses.
- **Vague Response and Expression Limitation:** Respondents may struggle to effectively communicate their perspective due to language limitations, or topic unfamiliarity. Open-ended responses can vary in quality and detail as respondents might give vague responses, making it harder to extract useful interpretations.
- **Subjective Interpretation:** Biases could be introduced due to subjective interpretation caused by researchers.
- **Time Intensive:** Analysis of open-ended responses needs a specific approach known as “thematic analysis” as categorizing and interpretation can take more time and effort.
- **Reduction of Clarity And Consistency:** Trying to identify general connections such as motivation or concerns will require significant efforts in coding the responses, leading to a reduction in consistency and clarity.
- **Skills in Survey Design:** Balancing open-ended and closed-ended questions is key as a risk may be overburdening respondents therefore, the survey needs to be direct and short (Purandare and Patil, 2023).



3.3 ANALYSIS METHOD

(Content Analysis and Thematic Analysis)



3.3.1 General Background

A systematic research method known as "Content Analysis" will be used to quantify and categorize text based data by observing key concepts, patterns and keywords. It is highly beneficial when analysing significant amounts of qualitative data. This analysis method would help sort out female consumers' opinions on specific aspects such as the concept of transforming food waste into garments.

On the other hand, "Thematic Analysis" focuses on identifying patterns or themes from qualitative data, allowing a deeper exploration of opinions, concerns, lifestyles, values and other factors shaping customer attitude. In other words, It reveals reasons why customers might adopt or withstand the garments.

Both methods Content Analysis and Thematic Analysis complement one another, providing this research with a rich output where consumers' attitudes towards transforming food waste into garments is understood.

3.3.2 Benefits

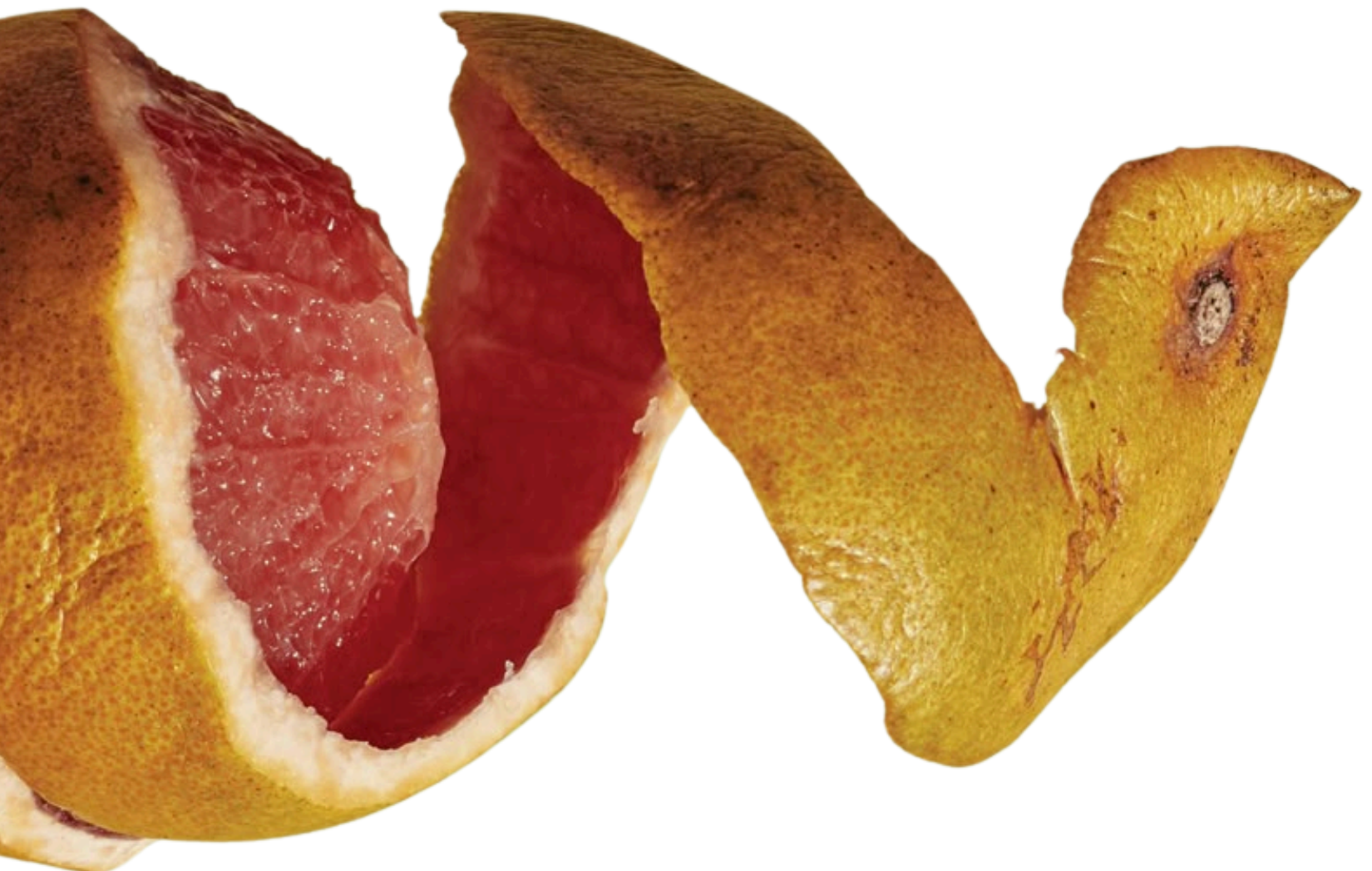
Content Analysis

- **Categorization:** Content Analysis assists the organization of a large capacity of qualitative data as it categorizes fundamental responses allowing the analysis to be more structured.
- **Quantification:** It provides an insight of recurring themes, allowing a clearer concept of the frequent concerns among consumers.

Thematic Analysis

- **Insight Depth:** Thematic Analysis empowers the exploration of deeper patterns in consumer response.
- **Flexibility:** It allows presumed and emerging concepts, contributing to useful interpretative insights and helps investigate complex customer values.

Content Analysis and Thematic Analysis together enriches the study of consumer attitudes towards food waste as a garment which balances depth and structure (Dierckx de Casterlé et al., 2012).



3.3.3 Process

Content Analysis

- Familiarization: Open-ended responses skim to gain an overall understanding.
- Coding: Predefining or emerging main concepts known as codes.
- Categorization: Arranging codes into broader categories and quantifying them.
- Interpretation: Observe and interpret patterns or common concepts.

Thematic Analysis

- Familiarization: Study the responses, underlining and understanding the depth of consumer perspectives.
- Coding: Observe and identify features or concepts that stand out.
- Searching: Broaden group codes and search for themes.
- Reviewing: Filter the themes ensuring data is accurately reflected and remove overlaps.
- Defining: Clearly state the chosen themes and investigate the interconnection.
- Interpreting: Explain the deeper definition of consumer attitudes [Dierckx de Casterlé et al., 2012].





3.3.4 Limitations

Content Analysis

- Loss of Context: Categorizing and breaking down data could lead to loss of context.
- Oversimplification: Limiting focus on frequency counts of concepts could cause oversimplifying complex perceptions.

Thematic Analysis

- Subjectivity: Themes interpretation could be biased as it may be influenced by the researcher's biases.
- Time-Consuming: Categorizing and analyzing qualitative data requires effort and time.

Both methods need constant caution while handling to minimize bias (Dierckx de Casterlé et al., 2012).

3.4 OUTLINE OF Research Design PROCESS AND DIAGRAM

The following list outlines the step-by-step process of the research and is followed by a general diagram that illustrates the different instances of the research, including progression and cross-referencing. So, the research sequence will be as follows:

1. Research & Mind Mapping
2. Problem Identification
3. Literature Review
4. Aim & Objectives
5. Research Question
6. Research Methodology
7. Data Collection & Analysis
8. Experimentation
9. Results & Findings
10. Output



3.5 SURVEY ANALYSIS

Content Analysis

Demographics



Content Analysis

Ages: 15-19
32.4%



Ages: 20-29
56.8%



Ages: 30-39
10.8%

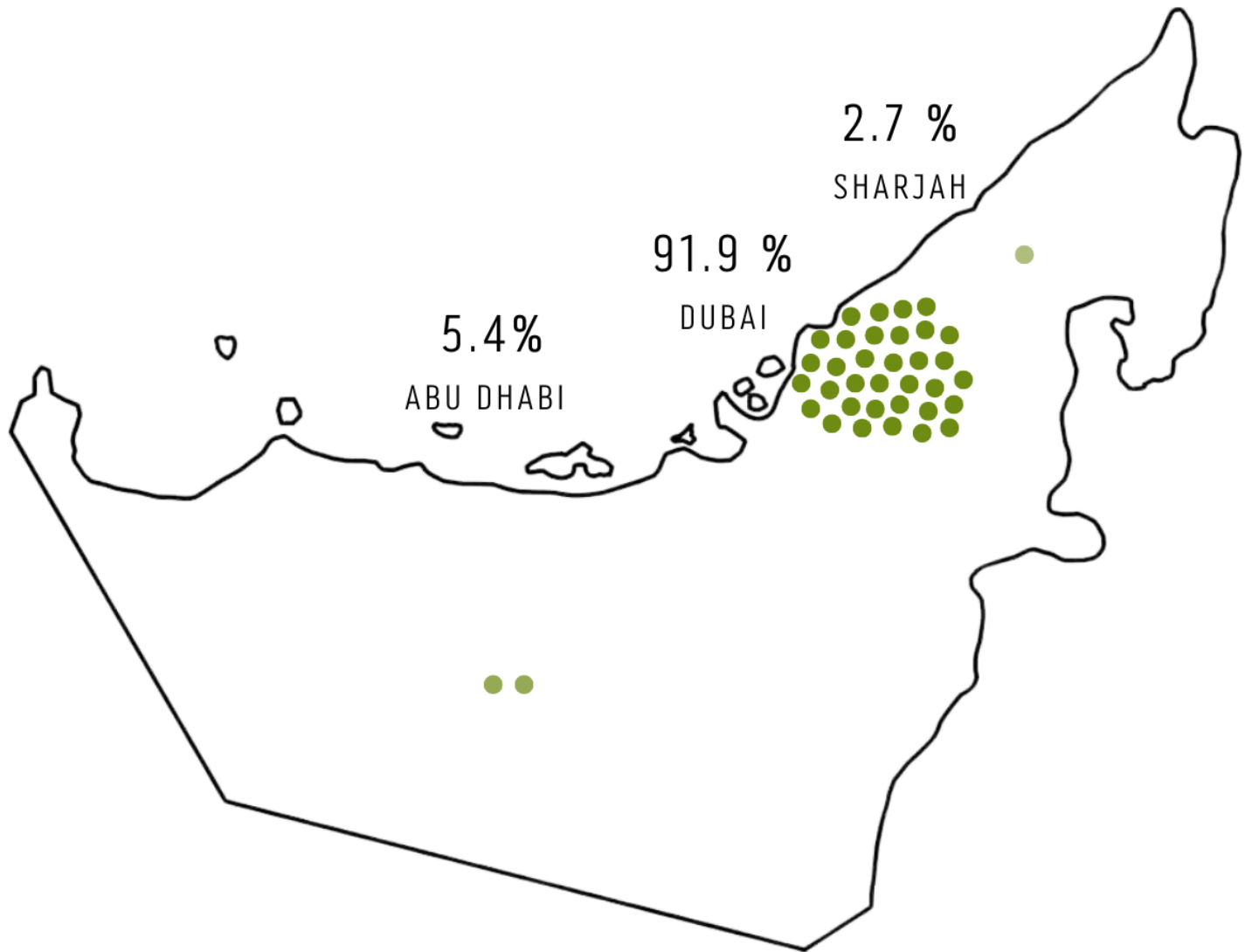


Age Distribution

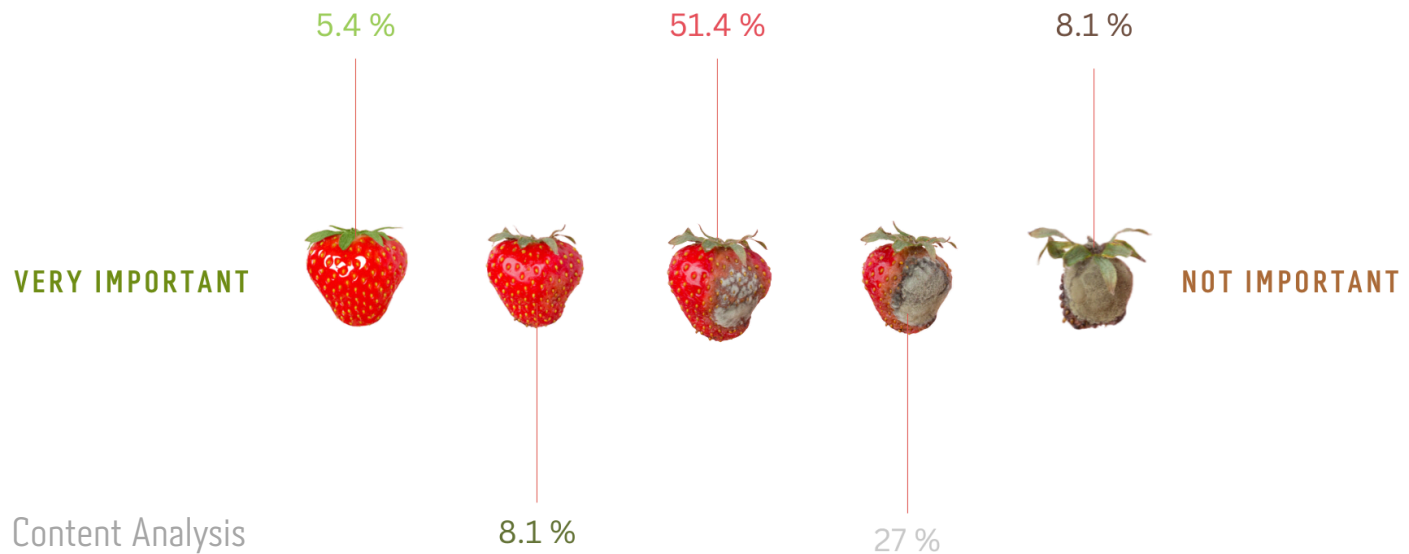
- 20-29 years old: Majority of respondents [56.8%].
- 15-19 years old: Moderate number of respondents [32.4%].
- 30-39 years old: Least number of respondents [10.8%].
- Other age groups: Did not participate due to limitations of reach data.

Country of Origin and Emirate of Residence

- Respondents are from 11 diverse backgrounds, residing in Dubai, Abu Dhabi and Sharjah.



Q1: How important is sustainability to you when purchasing clothing?



Content Analysis

- Very Important: 5.4%
- Important: 8.1%
- Neutral: 51.4%
- Not Very Important: 27%
- Not Important at All: 8.1%

Noted Patterns

Neutral: 51.4%

- More than half of the respondents are neutral about the importance of sustainability when purchasing clothes. This indicates that consumers are aware of the importance of sustainability but it does not drive their decisions.

Important and Very Important: 13.5%

- A small niche eco-conscious group of respondents considers sustainability as a highly important factor when purchasing. This indicates that their values align well with the Food Waste concept and they could be the first buyers.

Not Very Important and Not Important at All: 35.1%

- More than a third of respondents perceive sustainability as low in importance during their garment purchases. This indicates that this segment prioritizes other elements over sustainability and this could be due to unawareness.

Overall, the majority 51.4% of the respondents is a potential segment that could briefly be educated on environmental awareness and the benefits of this garment production on the environment. Moreover, a small group 13.5% are eco-conscious consumers with awareness that sustainability needs to be part of their purchasing decision. Furthermore, certain tailored strategies would help shift the perception of the 35.1% of respondents that do not take sustainability into consideration.



Thematic Analysis

- [13.5%] is a combination of the respondents considered sustainability [5.4%] crucially important or [8.1%] somewhat important when purchasing garments. This group represents eco-conscious consumers.
- [51.4%] of the respondents considered sustainability moderately important as they acknowledge its importance but may prioritize other factors. Therefore, the criteria of sustainability is neither a high priority nor entirely irrelevant during their purchasing decisions.
- [35.1%] is a combination of the respondents who considered [27%] sustainability less or [8.1%] did not consider it at all as an important factor when purchasing garments. This group prioritizes a variety of different elements before sustainability.

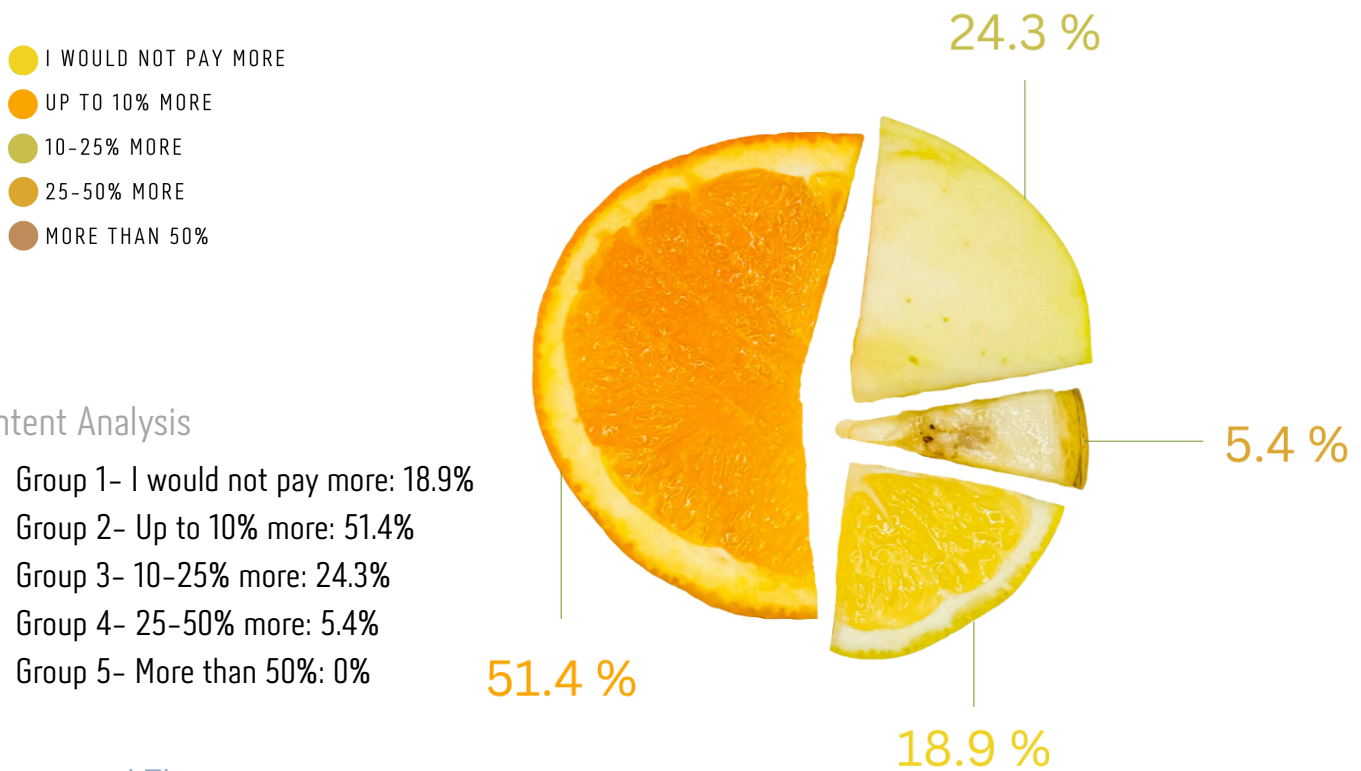
Dominant Neutrality

- Most participants fall in the middle, indicating that sustainability is neither fully integrated into their values nor completely disregarded.
- This suggests room for growth in consumer awareness and engagement around sustainable practices.

Conclusion

- Overall, there has been a strong contrast indicated between consumer attitudes towards purchasing sustainable garments. On one hand, a larger group [35.1%] shows the low importance of sustainability while purchasing garments. On another hand, [13.5%] of the respondents align strongly with sustainable purchases.
- The majority of the respondents [51.4%] and the [35.1%] of respondents require further education on sustainability and the effects of synthetic garments on the environment.

Q2: How much more would you be willing to pay for sustainable garments made from food waste?



Patterns and Themes

Group 2: 51.4%

- Over half of respondents are happy to pay a small difference in return for sustainable garments. This is because most consumers have budgets and are cautious about their spendings.

Group 3: 24.3%

- Around a quarter of respondents are willing to spend a moderate premium, indicating a niche, committed group of eco-conscious buyers. This suggests that they value sustainability but have quality and functionality expectations on the other hand.

Group 1: 18.9%

- A notable number of respondents are unwilling to pay more than fast fashion garment prices prioritizing affordability.

Group 4: 5.4%

- A very small portion of respondents are willing to pay 25% or more, and none indicated willingness to pay over 50%. Although a small group exists for premium pricing, the wider population remains price sensitive.

In conclusion, price sensitivity is a crucial component when it comes to purchasing sustainable garments. Raising awareness regarding this matter is a necessity in order to shift consumer perception of individuals that are unwilling to pay more. Taking affordability into consideration while creating a garment is key for the garment to be accessible to a bigger audience.

Thematic Analysis

Majority Willingness (Up to 10% More):

- The largest group, 51.4% of respondents, are willing to pay up to 10% more for sustainable garments made from food waste. In other words, many consumers value sustainability but have a limited willingness to pay way more than affordable options.

Moderate Willingness (10–25% More):

- The second-largest group, 24.3%, would pay 10–25% more. Moreover, this group has a stronger commitment to purchasing and supporting sustainable garments made of food waste.

Non-willingness to Pay More:

- 18.9% of respondents are not willing to pay anything extra for sustainable garments. This group prioritizes cost over sustainability.

High Willingness (25–50% More):

- A smaller percentage (5.4%) would pay a significant premium of 25–50%. This is a niche market with strong ethical values and financial flexibility.

Extreme Willingness (More than 50%):

- None of the respondents indicated a willingness to pay more than 50%.

Overall, the majority of the consumers are price sensitive and seek to balance affordability and sustainability, requiring competitive pricing strategies. As seen from the data a small niche is willing to pay a significant amount more than fast fashion brands reflecting an opportunity for a small premium sustainable market.

In order for consumers to value food waste based garments they need to be educated further on the impact of fast fashion and food waste on the environment and the value of sustainable garments shifting consumer perception.



Q3: What factors would most influence your decision to purchase garments made from food waste?
[Select all that apply]



Content Analysis

- Price: 56.8%
- Quality and Durability: 86.5%
- Design and Aesthetics: 75.7%
- Brand Reputation: 35.1%

Patterns and Themes

Quality and Durability 86.5%

- Majority of respondents prioritize quality and durability. This indicates that the materials need to be tested and meets consumer expectations of functionality and durability.

Design and Aesthetics 75.7%

- Design and aesthetics are the second priority as many respondents seek aesthetics and personal identity expression through their garments.

Affordability 56.8%

- Over half of respondents voted for affordability mirroring the importance of fairly pricing the garments for the accessibility of a wider audience.

Brand Reputation 35.1%

- A small portion of respondents care about brand reputation and the extent of its transparency.

Overall, quality, aesthetics and affordability are the key elements influencing consumer's purchases. Although brand reputation and transparency matter to some, the majority consider quality, aesthetics and affordability more critical for them to buy a garment made of food waste.

Thematic Analysis

Quality and Durability (86.5%):

- Quality and Durability was the most significant factor influencing respondent's purchasing decisions. This segment prefers functional and practical garments that are long lasting
 - Respondents prioritize garments that offer practical benefits such as longevity, indicating they value tangible outcomes over abstract sustainability ideals.

Design and Aesthetics (75.7%):

- Design and aesthetics influenced [75.7%] of the respondents purchase decisions. This segment of consumers look forward to purchasing garments that match their personal style and preferences.

Price (56.8%):

- Price is a core factor to [56.8%] of the respondents. This indicates that affordability is a crucial consideration when purchasing.

Brand Reputation (35.1%):

- Brand reputation influences the purchasing decisions of a smaller percentage of respondents. This segment values brand trust, ethical practices and transparency.

Overall, most consumers prioritize quality and design mirroring a preference for functionality and aesthetics of garments during their purchases. Moreover, in order for a garment to appeal to a bigger audience, affordability plays an important role indicating that sustainable garments must be affordable. This thematic analysis shows that to meet consumers expectations sustainability is a secondary criteria when purchasing garments therefore the main focus should be on balancing between quality, style, and affordability.



Q4: What are your general thoughts on the idea of transforming food waste into clothing materials?

SUSTAINABILITY AND CONSUMER
AWARENESS

PSYCHOLOGICAL BARRIER

OPEN-MINDEDNESS

CURIOSITY

CONCEPT ACCEPTANCE

AESTHETICS AND DESIGN

QUALITY

AFFORDABILITY

Content Analysis

- Sustainability: Noted in 10 responses.
- Design and Aesthetics: Referenced in 3 responses.
- Durability and Quality: Highlighted in 6 responses.
- Affordability: Referenced in 3 responses.
- Psychological Barriers: Mentioned in 3 responses.
- Curiosity: Noted in 7 responses.
- Open-Mindedness: Reflected in 31 responses.



Noted Patterns and Themes

Innovative

- *"Transforming food waste into clothing materials is an innovative and eco-friendly idea."*
- *"I believe it's a step forward in the fashion world, giving waste a second chance at life."*

The concept is new and uncommon, grabbing the attention of many individuals, allowing food waste based garments to be a strong selling point in markets.

Environmental Benefits

- *"It's a good way to minimize waste."*
- *"It's nice to see clothing made from recycled materials. The planet is being ruined by fast fashion."*

Sustainability and waste reduction is appreciated by the respondents and the food waste based garments align with eco-conscious consumers.

Curiosity and Interest

- *"I'd love to know more about it."*
- *"I find that truly amazing and creative! I am very interested in how the outcome would be."*

Many communicated their curiosity about the process and output. This could help build a connection between the garment and the consumer.

Durability and Functionality

- *"It needs to be durable and long-lasting."*
- *"Challenges include ensuring the durability and functionality of these materials."*

A few respondents questioned the functionality and durability of the food waste based garment conveying the necessity of explaining how to handle the material.

Affordability

- *"Turning food waste into clothing materials could help reduce waste but faces challenges in cost and consumer acceptance."*
- *"I like the idea as long as the quality is good and price isn't too expensive."*

Affordability is a critical element for consumer acceptance.

Overall, the idea is perceived as innovative and the concept gained curiosity from the respondents. The curiosity people have could be a transparent story of raw waste material to an end product story. Moreover, respondents also suggested that durability and affordability are elements that require focus.

Thematic Analysis

- Theme: Concept acceptance

Many words were used to express the respondents perspective towards the concept of wearing garments made of food waste. Words such as "innovative", "interesting" and "creative" were often mentioned. This suggests a strong acceptance and support from consumers towards the concept.

- Theme: Sustainability and consumer awareness

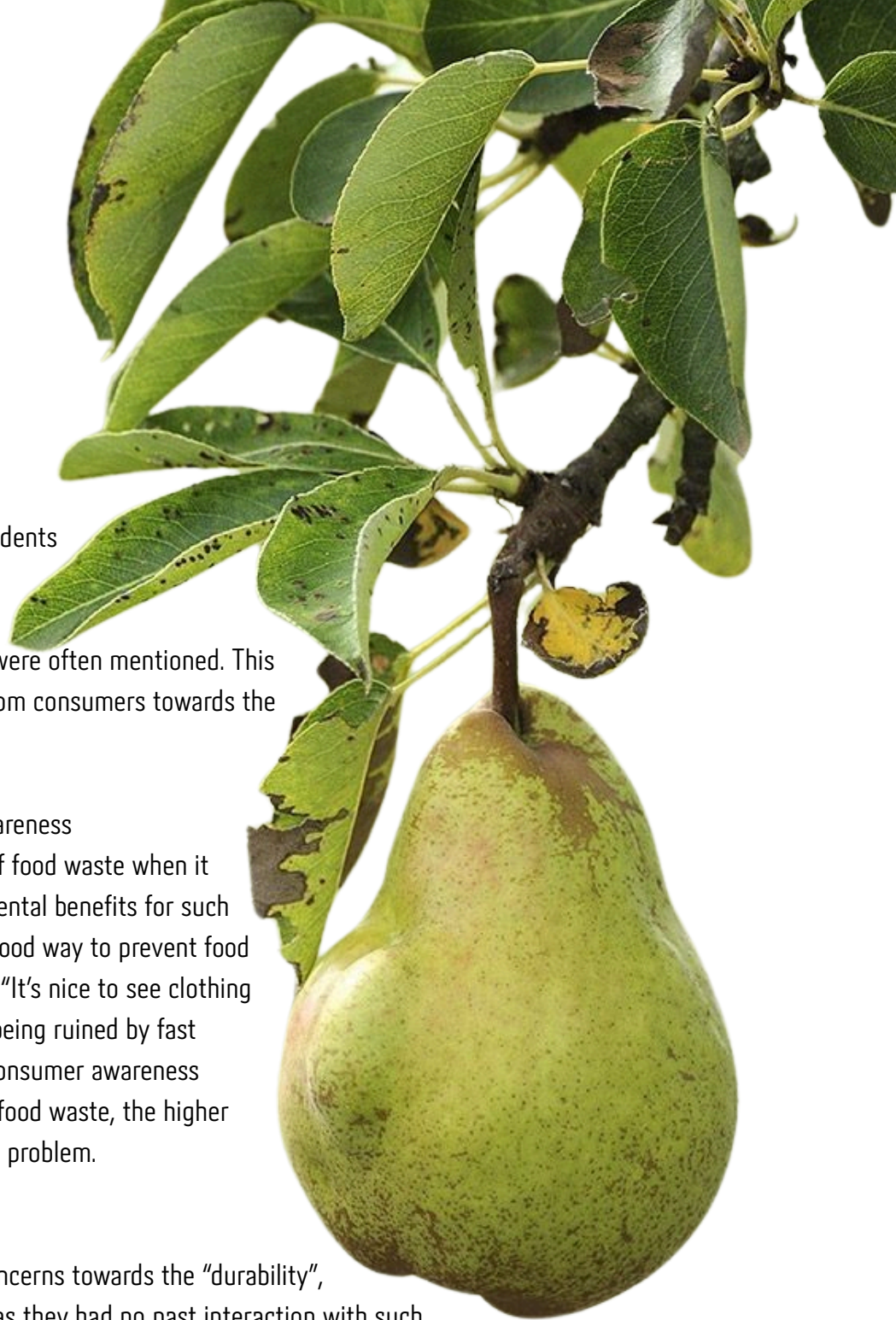
A few respondents were aware of the harm of food waste when it ends up in landfills and highlighted environmental benefits for such a concept. Respondents stated "It's a really good way to prevent food waste from being dumped into landfills." and "It's nice to see clothing made from recycled materials. The planet is being ruined by fast fashion.". This indicates that an increase in consumer awareness towards the environmental consequences of food waste, the higher engagement and contribute to alleviating the problem.

- Theme: Quality

A number of respondents mentioned their concerns towards the "durability", "longevity", and "functionality" of garments as they had no past interaction with such material. Consumer trust and quality assurance is a core factor for their full acceptance of the concept. This means that customers will need to know the testing that the material went through and they would need to feel the texture person to person in order to clarify any doubts.

- Theme: Affordability

Affordability was a common element that many respondents agreed on, highlighting that the price of the garment is a decisive component to market acceptance. Responses included, "I like the idea as long as the quality is good and price isn't too expensive." and "Turning food waste into clothing materials could help reduce waste and create eco-friendly fabrics, but it still faces challenges in durability, cost".



Thematic Analysis

- Theme: Psychological barrier

A few respondents associated the word "food waste" with the concepts of "dirty" or "smelly". This propounds the need for an awareness campaign on how food waste is well sanitized to address any misconceptions and emphasize the garments safety.

- Theme: Curiosity

Several responses communicated their curiosity by wanting to "learn more" or see "how it's done." Fostering a greater acceptance towards the concept could be done by showing consumers the process and outcome of the raw materials and the garment through storytelling and transparency. Responses included, "I think the idea of transforming food waste into clothing materials is an interesting concept with potential environmental benefits. However, I'm not particularly focused on it at the moment and would be curious to see how it develops in the future." and "I think it's generally an interesting concept, and I'd love to know more about it."

- Theme: Aesthetics and Design

All respondents underlined the need for the garments to be aesthetically appealing. Responses included "I believe it's a step forward in the fashion world, giving waste a second chance at life." and "I think it's very innovative if done in an aesthetic manner." Therefore, design and aesthetics are a crucial criteria for sustainable designs.

- Theme: Open-Mindedness

Most respondents were very open to trying and purchasing food waste based garments and responses included "I am supportive of it.". However, a few respondents were hesitant, but they still had the will to try the garment "I didn't quite like the idea, but I don't mind trying it."

In conclusion, all customers were supportive of the concept and open to trying the garments on. Moreover, many of the respondents were curious about the process and the output of the final garment. The only concerns were durability, functionality, cost and cleanliness.



Q5: In your opinion, what would make a garment made from food waste appealing to you?

AFFORDABILITY

EMOTIONAL CONNECTION

ECO-CONSCIOUS

SENSORY APPEAL

BIODEGRADABILITY

QUALITY

AESTHETICS
AND DESIGN

Content Analysis

- Design and Aesthetics: Referenced in 15 responses
- Quality and Durability: Mentioned in 12 responses
- Affordability: Highlighted in 8 responses
- Sustainability: Presented in 10 responses
- Unique Elements: Suggested in 7 responses



Noted Themes

Design and Aesthetics

- *"Aesthetically pleasing design."*
- *"I would want it to stand out from other designs, but still be durable and practical to wear."*
- *"Cool design, timeless, and comfortable."*

Respondents prioritize pleasing, timeless, comfortable designs during their purchases.

Quality and Durability

- *"Its ability to stay usable similar to normal clothing."*
- *"The quality should be extremely good, comparable to premium garments that aren't sustainable."*
- *"Comfort, story, texture, color, etc."*

High quality, durable garments are within the consumer priority expectations.

Affordability

- *"If the price is reasonable and the quality meets my expectations, I'd be more inclined to consider it."*
- *"Affordable while being eco-friendly."*
- *"Pricing."*

The garments need to be cost effective and all respondents value the balance between sustainability and cost.

Sustainability

- *"It reassures me that I am contributing to something ethical."*
- *"The fact that it was made from food waste and recycled."*

Underlining the environmental benefits of food waste based garment if appreciated by eco-conscious buyers.

Unique Elements

"Should have an identity showing it's made from fruit waste."

"If they are somehow scented, like orange peels smelling like oranges."

"Storytelling could further enhance its appeal."

Some respondents expressed their interest in product differentiating attributes like scents, textures and garment production.

In conclusion, the food waste garment includes differentiating attributes that would allow it to stand out in markets. It's highly important to bridge the gap between design, price and sustainability to target a larger audience.



Thematic Analysis

Theme: Aesthetics and Design

- Common words such as “style”, “aesthetics”, “design” and “color” were frequently mentioned. Aesthetics is a priority for consumers as they would like a traditional option in terms of design but with the use of sustainable material.

Theme: Quality

- Many of the responses pointed out the need for durable, comfortable and functional garments in phrases such as “usable similar to normal clothing” and “extremely good quality”. It is key to ensure that the quality is very good and that the garment performs very well in order for consumers to purchase it .

Theme: Affordability

- The words “pricing” and “affordable” were used to express consumer affordability concerns. When a garment is within the same range of other garments and is affordable to the target market then there is a higher chance for consumers to purchase the garment as a large number of responses repeatedly stated the importance of affordability. This strategy of competitive pricing will help overcome the stereotype that sustainable garments are always way more expensive.

Theme: Eco-Conscious

- Many respondents would like to contribute to sustainability and love the concept of providing food waste with a new life. For example, someone stated “I like the idea a lot since it is a good way of recycling.” and someone else stated that purchasing such a garment would “Reassure me that I am contributing to something ethical.”

Theme: Emotional connection

- A few responses noted the importance of a captivating backstory. For example the respondent suggested “should have an identity showing its made from fruits waste or something preferably the storytelling” or “a compelling backstory about reducing food waste or supporting sustainability”. A simple story behind the concept or the process and its beneficial impact could create an emotional connection between the consumer and the garment.

Theme: Sensory Appeal

- Elements like “smell” and “texture” are an area of interest of some respondents. One of the respondents suggested “If they are somehow scented [like something that’s made of orange peels should smell like oranges]”.However, some others suggested a “no smell” garment as the scent of the garment is normally an individual choice.

Theme: Biodegradability

- Some responses noted an interest in mimicking vegan leathers. Moreover, many suggested “It would be super great if these garments could biodegrade after several years of use” supporting the concept of biodegradability as this would differentiate a sustainable garment from fast fashion.

Overall, the key elements consumers prioritize are quality, functionality, aesthetics and affordability. Some consumers suggested a compelling background story to increase the emotional connection.

Q6: What single feature would make you choose a garment made from food waste materials over other options?

QUALITY

ECO-CONSCIOUSNESS CONSUMERS

SENSORY APPEAL

DESIGN AND AESTHETIC

AFFORDABILITY

Content Analysis

- Sustainability: Referenced in 10 responses.
- Design and Aesthetics: Noted in 12 responses.
- Durability and Quality: Mentioned in 9 responses.
- Affordability: Highlighted in 5 responses.
- Unique Elements: Mentioned in 5 responses.



Noted Themes

Sustainability

- *"Knowing that the garment is contributing to reducing waste and has a lower carbon footprint would be a key deciding factor for me."*
- *"Its sustainability, particularly its ability to reduce environmental impact by repurposing waste."*
- *"The fact that it's sustainable and a new idea."*

Many respondents appreciate sustainable garments and seek to reduce environmental harm.

Design and Aesthetics

- *"A nice design."*
- *"The overall look of the garment."*
- *"The aesthetics, if it is my style (minimalistic) and fairly priced, I would choose the garment."*

Respondents value garments that contribute to sustainability and reduce environmental harm.

Durability and Quality

- *"Mainly the texture and durability."*
- *"Durability."*
- *"The quality of the material and the aesthetic."*

Consumers like to have quality garments that are worth their price as they are high quality, functional and durable.

Affordability

- *"Normal prices."*
- *"Price and durability."*
- *"If the price is reasonable and the quality meets my expectations, I'd be more inclined to consider it."*

Cost is a decisive factor to many individuals as consumers seek reasonable prices that they could afford.

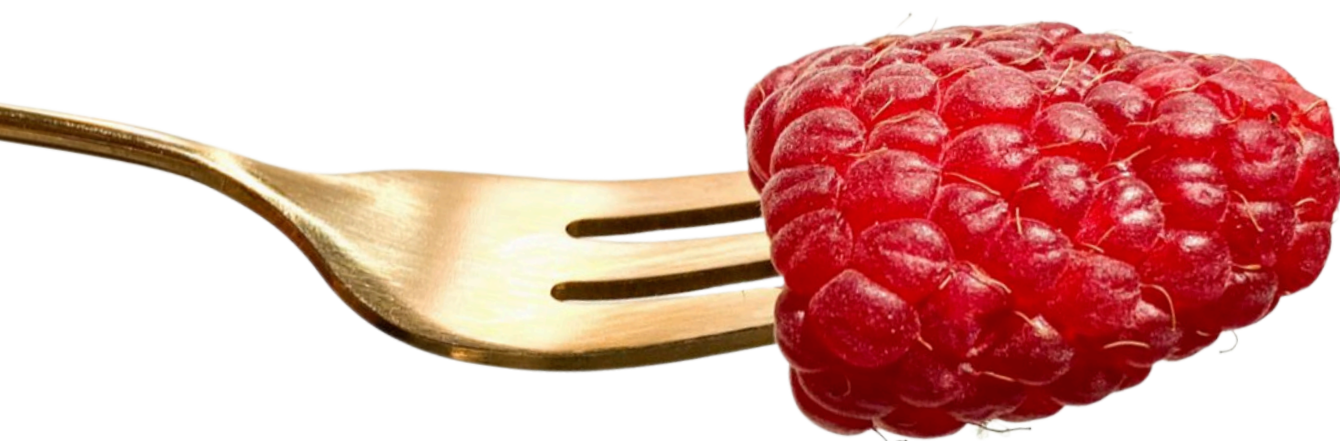
Unique Elements

"Maybe if it had a nice scent."

"The nice smell of fruits that it emits could replace perfumes."

"Texture of fabric, scent of fabric, sustainability, and ethically environmental practices."

Unique elements including texture, scent and design would allow the garments to stand out and increase its appeal. In conclusion, ensuring a premium design and high quality garment is key for the success of the market acceptance.



Thematic Analysis

- Theme: Eco-Consciousness consumers

Many respondents emphasized sustainability as their top motivator for choosing food waste based garment as some stated, "The single feature that would make me choose a garment made from food waste materials is its sustainability and environmental impact." and "Knowing that the garment is contributing to reducing waste and has a lower carbon footprint would be a key deciding factor for me."

- Theme: Design and Aesthetic

A large number of respondents stated that the "design" is the top deciding factor when purchasing a garment. Respondents answered with "A nice design." "The aesthetics, if it is my style [minimalistic]" and "The overall look of the garment." It is extremely important to bridge the gap between consumer desire and sustainability.

- Theme: Quality

Many respondents mentioned that their purchasing decisions are mostly relying on durability and quality. Respondents stated, "The key feature that would make me choose a garment made from food waste materials is its sustainability, while still offering comparable quality and others responded with "Durability." or "Quality." Consumers expect a high quality, durable material in order for them to purchase a garment.

- Theme: Affordability

It was repeatedly cited that the price needs to be affordable as this influences consumers purchasing decisions. Respondents stated, "Normal prices." and "fairly priced.", it is a necessity to price sustainable garments at an affordable range in order for it to be accessible to a larger audience.

- Theme: Sensory Appeal

A few respondents underlined features such as "scent" and "texture" as deciding factors. Responses included "Texture of fabric, scent of fabric", "The nice smell of fruits that it emits could replace perfumes." and "Texture/pattern/color." The different sensory elements could be the unique selling point of the garment to enhance consumer-garment interaction.

In conclusion, sustainability, aesthetic, quality and affordability are core factors that influenced respondents purchasing decisions. While some additional elements such as scent and texture add to the appeal of the garment in few perspectives.



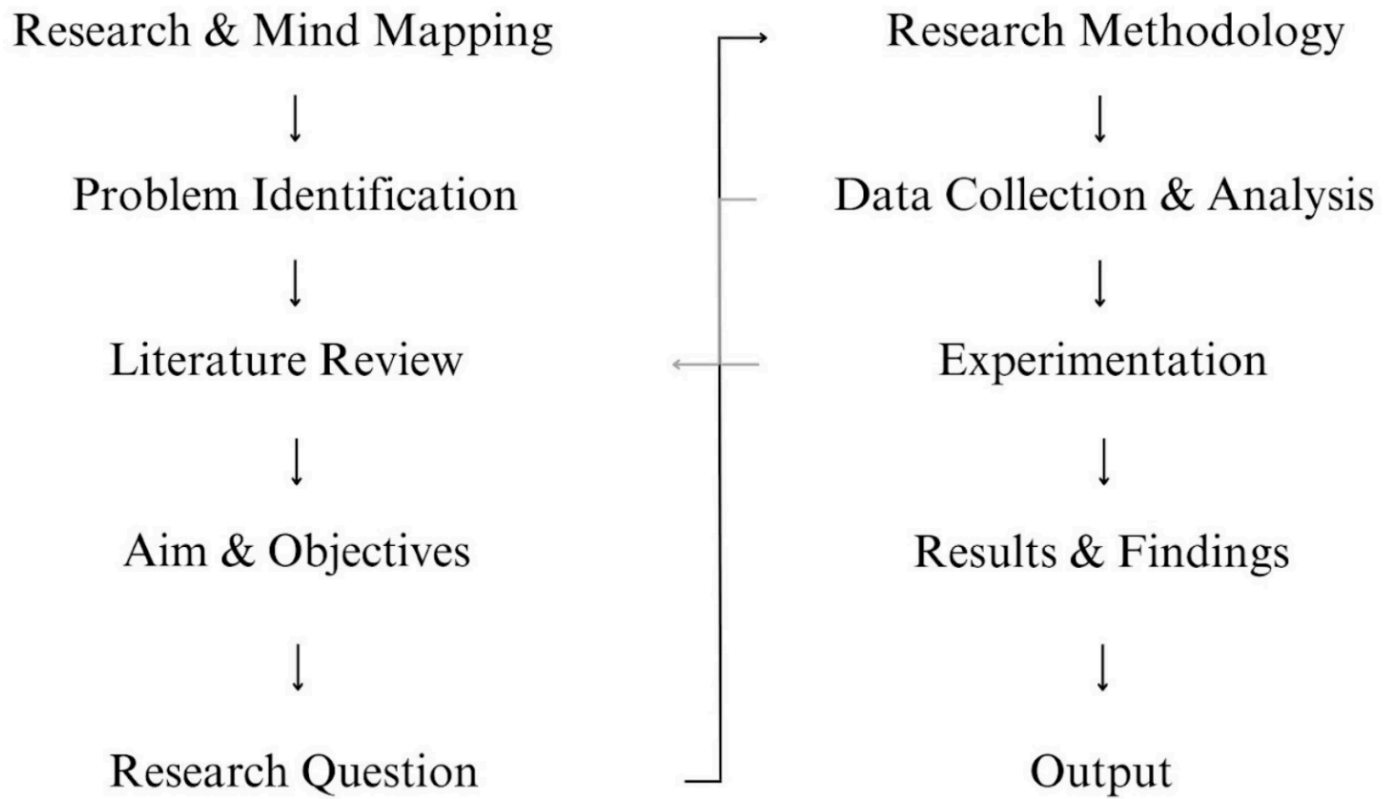
3.6 SURVEY ANALYSIS CONCLUSION

In conclusion, the majority of the respondents were supportive of the concept reflecting interest in the purchase of the food waste based garment. The main concerns were regarding the durability of the material and accessibility and most respondents mentioned that for a successful purchase of a garment a balance between price, aesthetics and quality is a requirement. This survey was among individuals aged 15-39. It reflected a highly positive reaction toward food waste-based garments, reflecting a significant success of the implementation of food waste based garments in the UAE.

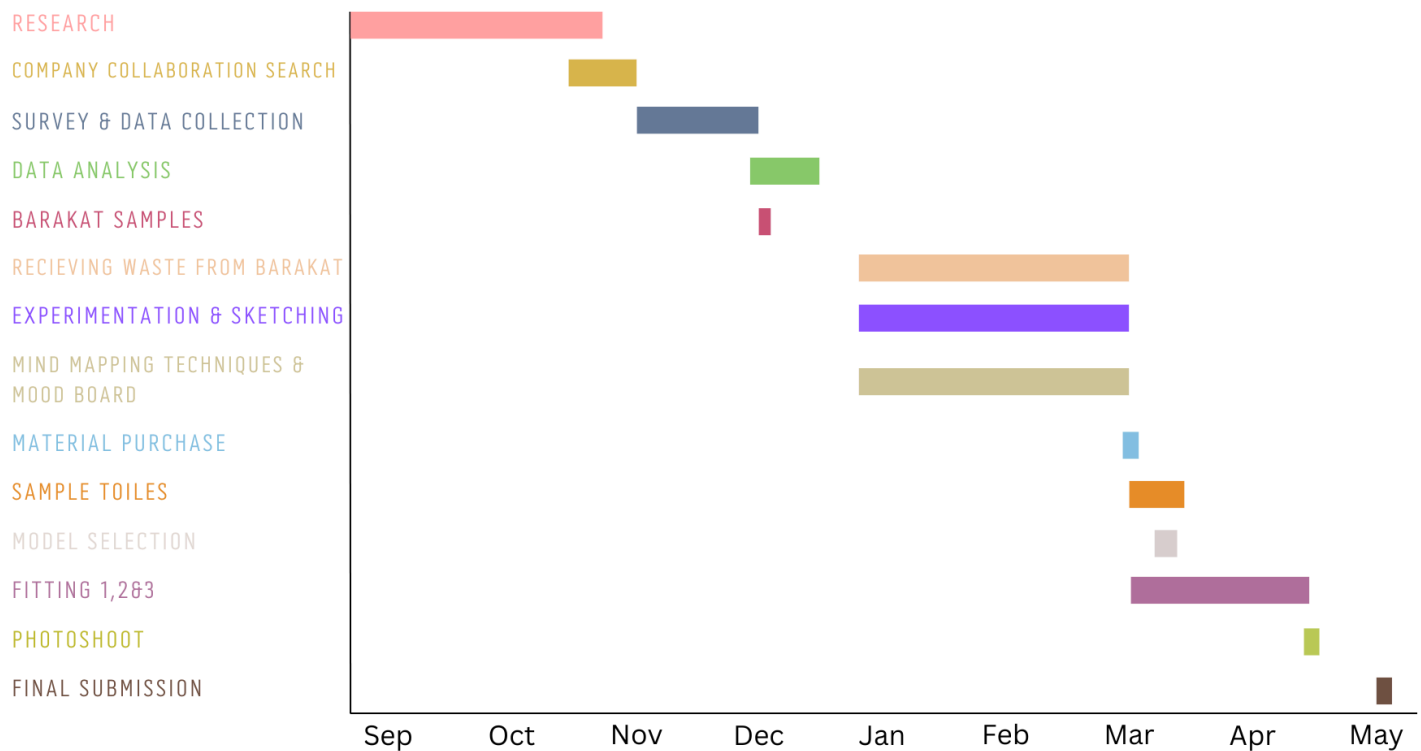
Moreover, some respondents mention that a compelling background story would increase the connection and the addition of unique elements could help create a unique product in a busy market. Furthermore, a curiosity among the respondents has been noted where they would like to know about the production process and the final garment design. I will be working on designing aesthetic evening gowns for ages 20-30 as they are the demographic that mostly contributed to the survey reflecting their high demand for an aesthetically sustainable garment.



3.7 OUTLINE OF Research Design PROCESS AND DIAGRAM



3.8 GANTT CHART



3.9 METHODOLOGICAL LIMITATIONS

- Collaborating with Barakat would secure the availability and consistency of food waste as it is a controlled source, however, seasonal variations may lead to supply inconsistencies.
- Sample consumer survey size would be limited and perceptions gathered cannot be generalized.
- Manual experimentation would only be done due to financial limitations.
- Exploration would not be maximized as time provided is insufficient for a fully detailed research and analysis.
- Qualitative data is heavily relied on which introduces biases.
- Resource constraints as not all substances used in methods would be available.
- Regional constraint, this thesis is testing consumer potential towards sustainability, if this is concluded in a certain way, it does not mean that other regions would necessarily have the same potential towards sustainable fashion.
- Long term testing of the biodegradability of garments is a necessity in order to examine if any environmental impacts are applicable.



3.10 Ethical Considerations

The following summarizes the research's different approaches for maintaining the trustworthiness of the research's findings and employed methods. These approaches could be summarized in relation to three main concepts: credibility, rigor and dependability. According to Paterson and Higgs, "credibility refers to the truth, value, or believability of the findings." (Patterson and Higgs, 2005, p. 352). To achieve this, the research adopted a series of working strategies, including surveys, content and thematic analysis.

In this research, authenticity was achieved through surveys, which was employed 'to pick up the threads' uncovered through observations and reviewed literature (Patterson and Higgs, 2005, p. 352). By doing so, the research attempted to instate the findings' plausibility, highlighting how "the findings of the study of utilizing food waste for garment production 'fit' the evidence from which they were derived [case studies]" (Patterson and Higgs, 2005, p. 352).

Also, the researcher adhered to the ethical guidelines prescribed by the GDPR for processing personal data, requiring "lawfulness, fairness and transparency; purpose limitation; data minimization; data accuracy; storage limitation; integrity and confidentiality (security); and accountability" (A guide to the data protection principles - Article 5). Since the study involved interviewing subjects, the researcher sought ethical clearance from authorities involved, if required.

In addition, throughout all evidence collection instances, the researcher pursued objectivity and considered all possible conflicting interests, aiming "to extend the scope of social enquiry and communicate their findings, for the benefit of the widest possible community" (Social Research Association, 2013, p.16). The researcher respected her obligation towards the larger community, by making accessible and fully describing the process and circumstances under which the research was conducted. This was also achieved by collecting informed consents from participants and by protecting their interests/anonymity. Finally, in writing the study, the researcher spared no efforts in adhering to the highest codes of conduct and academic integrity, acknowledging sources and contributors.

The consent form that will be distributed will contain necessary information about the data collection process, purpose of the study, and participant anonymity. The consent form template with approval from supervisors and DIDI academic officer is attached in Appendix A.





3.11 CONCLUSION

In conclusion, this thesis investigates the potential of repurposing food waste into sustainable garments. A qualitative survey would be used to gain deeper insights into female consumers perception in the UAE and their concerns as the survey would include open and close ended questions. This would communicate an idea about market feasibility and level of acceptance. However, this includes financial and regional limitations. Despite the challenges, this thesis aims to reduce food waste and contribute to sustainable fashion.

EXPERIMENTATION

4.1 BARAKAT

4.2 NATURAL FABRICS

4.3 NATURAL FABRICS CHARACTERISTICS LIST

4.4 FABRIC MANIPULATION

4.5 BIO-MATERIALS

4.6 RECIPE ITERATION

4.7 COLOR SAMPLES

4.8 3D PRINTING

4.9 CONCLUSION

COLLABORATION

This phase explores the development of bio-materials for garment production through extensive experimentation with various techniques, materials, and processes. Different mediums such as painting, block printing, laser cutting, and sewing were tested, alongside the dehydration of fruit and vegetable residues to assess their potential in textiles. The experimentation also included dyeing bio-materials with food coloring, adjusting ratios of ingredients to refine their characteristics, and selecting a base bio-material recipe for optimal structure. Residue was collected from Barakat Jebel Ali and household sources to create diverse material iterations. Additionally, 3D modeling and printing at IN5 were explored to enhance biomaterial applications with intricate patterns. These combined efforts aim to develop innovative and functional bio-materials suitable for garment design.

4.1 Barakat

Every few weeks, a group of fruit and vegetable residues were collected from Barakat Jebel Ali for use in different experiments. In addition, some residue was sourced from households to further explore different material applications. Below is an image of a batch received on a single day from Barakat.



NATURAL FABRICS

4.2 Natural Fabrics

For the base fabric pure natural cotton and linen have been selected due to their exceptional qualities. Both fabrics are highly breathable, soft, and comfortable to wear, making them ideal for garments. Additionally, they are natural and biodegradable, aligning with environmentally conscious practices. Another advantage of these fabrics is their availability in various thicknesses, which allows for flexibility in design, structure, and functionality. The choice of cotton and linen complements the integration of food waste-derived materials, ensuring a balance between innovation and wearability.



4.3 Natural Fabrics Characteristics List

FLEXIBILITY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
DURABILITY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
SUSTAINABILITY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
AESTHETIC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
EASE OF PRODUCTION	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
TEXTURED	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
SMOOTH	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
WATER RESISTANCE	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
STRENGTH	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
WEIGHT	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ADHESION COMPATIBILITY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BIODEGRADABILITY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
COLOR RETENTION	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
SCALABILITY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
COST-EFFECTIVENESS	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ECO-FRIENDLY	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

MATERIAL CRITERION

If a circle is colored in, it indicates that the characteristic applies to the material. The more colored circles there are for the same characteristic, the stronger or more prominent that characteristic is.

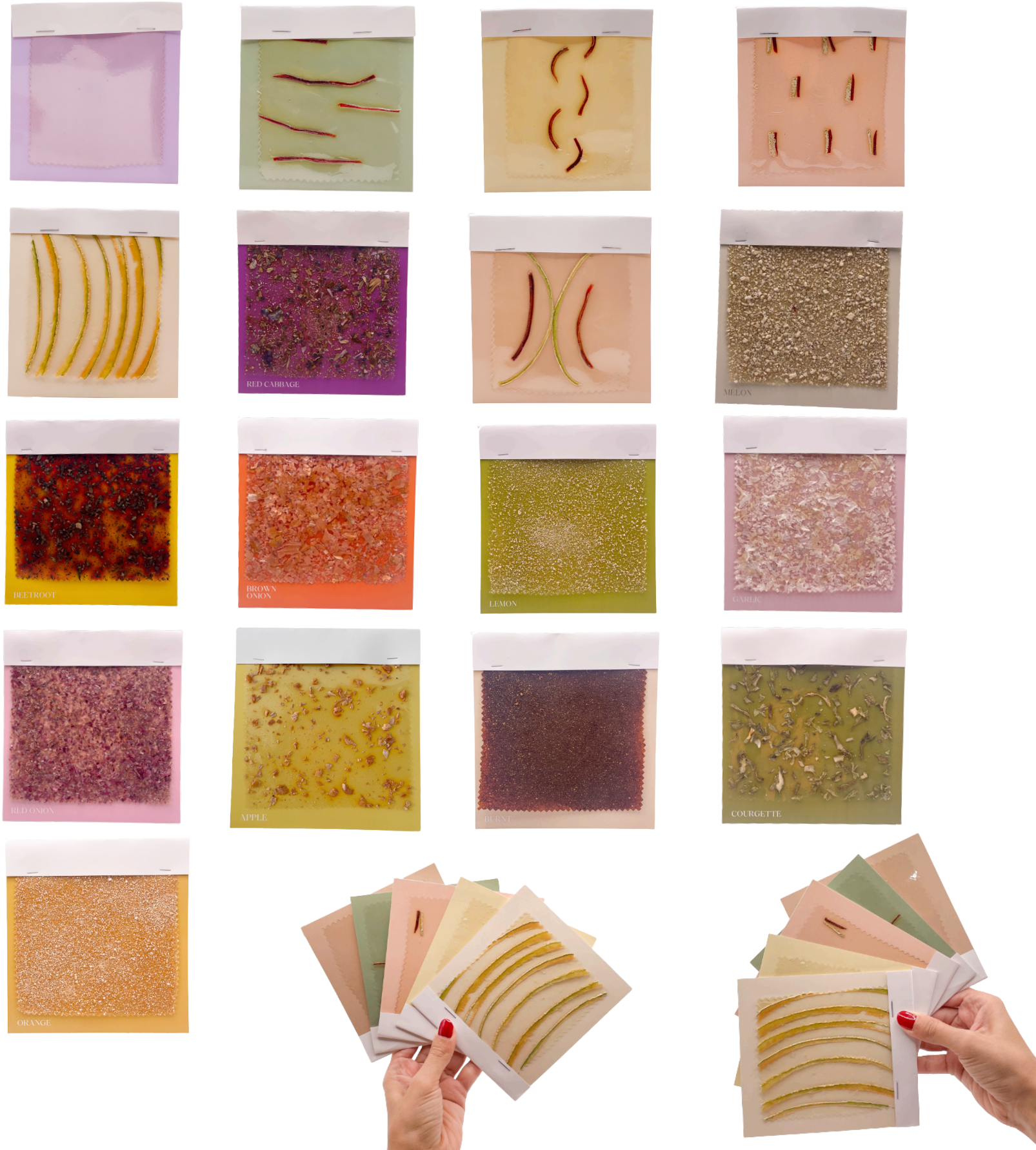
4.4 Fabric Manipulation

The experimentation phase involved exploring a variety of mediums and techniques to develop and refine material outcomes. These included painting, block printing, laser cutting, and sewing, as well as dehydrating selected fruits to assess their potential in textile applications. This hands-on approach provided valuable insights into the aesthetic, structural, and functional properties of different materials and processes, informing the design development.



4.5 Bio-Materials

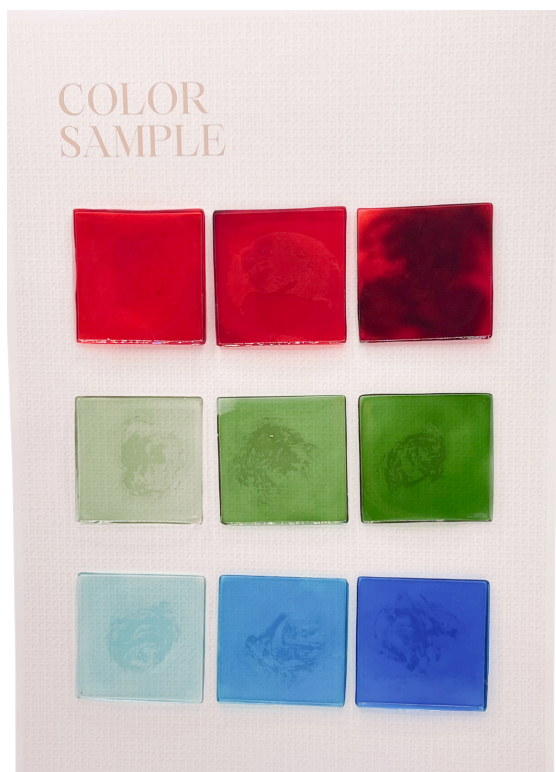
The experimentation phase also included the development of bio-materials to assess their potential for garment applications. Bio-material samples were created using fresh Barakat residue, with no visible mold formation, indicating promising material stability. Additionally, trials were conducted using dried residue, as well as blended residue, to achieve a smoother texture. These variations provided valuable insights into how different material compositions influence the durability, flexibility, and overall quality of the bio-material.



RECIPE & COLOR SAMPLES

4.6 Recipe Iteration

Different ingredients were used to create multiple iterations of the recipe, with variations in quantities to explore and manipulate the characteristics of the bio-materials. This experimentation allowed for a deeper understanding of how ingredient proportions affect the final material properties. However, the basic bio-material recipe will serve as the foundation for my fruit and vegetable residue, as it provides the ideal structure needed for my design.



4.7 Color Samples

Food coloring was used to dye the bio-materials, with three different shades of each color applied during experimentation. This approach provides flexibility, allowing for the selection of any desired color for the bio-materials at a later stage in the design process.

3D PRINTING

4.8 3D Printing

Furthermore, experimentation was conducted by 3D modeling interesting fruit and vegetable residues, which were then 3D printed at IN5 onto bio-materials. This process allowed for the exploration of intricate patterns and structures, enhancing the potential of the bio-materials for design applications.



4.9 Conclusion

In conclusion, the experimentation phase of this project involved the exploration of various mediums, techniques, and materials to develop a refined garment. Through the use of painting, block printing, laser cutting, sewing, and dehydrating selected fruits, valuable insights were gained into the aesthetic, structural, and functional properties of materials. Additionally, the use of different ingredient ratios allowed for further manipulation of the biomaterial characteristics. The basic bio-material recipe, which provides the ideal structure for my design, will serve as the foundation for imbedding Barakat's fruit and vegetable residues. This, combined with materials sourced from households, has enabled the creation of diverse iterations and has provided a deeper understanding of how residue influences the final material properties. 3D modeling and printing at IN5 further expanded the potential of bio-materials by adding intricate, customized patterns. These experimental approaches have shaped the development of an innovative design, ensuring that the bio-materials fulfill both functional and aesthetic requirements. Additionally, they align with the methodological findings, where consumers emphasized the importance of functionality and aesthetics.

CHAPTER 5

PHOTOSHOOT & PROCESS

5.1 PHOTOSHOOT

5.2 PROCESS PICTURES

5.3 BIBLIOGRAPHY

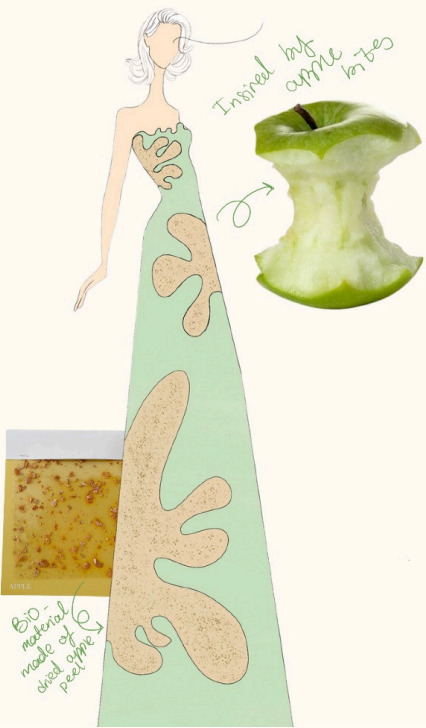
Photoshoot



Process



Redefining Food Waste Moodboard



BIBLIOGRAPHY

- Abdullah, M.M. (1975). The United Arab Emirates A Modern History. [online] <https://www.taylorfrancis.com/books/mono/10.4324/9781003071501/united-arab-emirates-mohammad-morsy-abdullah>. Available at: <https://www.taylorfrancis.com/books/mono/10.4324/9781003071501/united-arab-emirates-mohammad-morsy-abdullah> [Accessed 19 Oct. 2024].
- Bianucci, L. (2023). Parasitic fungus as leather: the story of MuSkin | tocco. [online] [tocco.earth](https://tocco.earth/article/fungus-alternative-to-animal-leather-muskin/). Available at: <https://tocco.earth/article/fungus-alternative-to-animal-leather-muskin/>.
- Brătianu, C., Zbucea, A., Anghel, F. and Hrib, B. eds., (2021). Shaping the Future of Business and Economy. [online] ResearchGate. Available at: https://www.researchgate.net/profile/Stanescu-Dan-Florin/publication/357506527_Applying_Technology_Acceptance_Model_TAM_to_Explore_Users%27_Behavioral_Intention_to_Adopt_Wearables_Technologies/links/61d0e08fb8305f7c4b191b7b/Applying-Technology-Acceptance-Model-TAM-to-Explore-Users-Behavioral-Intention-to-Adopt-Wearables-Technologies.pdf#page=623.
- Cambridge Dictionary (2019a). BIODEGRADABLE | meaning in the Cambridge English Dictionary. [online] Cambridge.org. Available at: <https://dictionary.cambridge.org/dictionary/english/biodegradable>.
- Cambridge Dictionary (n.d.). cellulosa. [online] @CambridgeWords. Available at: <https://dictionary.cambridge.org/dictionary/italian-english/cellulosa> [Accessed 27 Oct. 2024].
- Cambridge Dictionary (2023a). COMPOSING | meaning in the Cambridge English Dictionary. [online] [dictionary.cambridge.org](https://dictionary.cambridge.org/dictionary/english/composting?q=Composting). Available at: <https://dictionary.cambridge.org/dictionary/english/composting?q=Composting>.
- Cambridge Dictionary (2023b). CONSUMER | meaning in the Cambridge English Dictionary. [online] [dictionary.cambridge.org](https://dictionary.cambridge.org/dictionary/english/consumer). Available at: <https://dictionary.cambridge.org/dictionary/english/consumer>.
- Cambridge Dictionary (n.d.). DEGRADATION | meaning in the Cambridge English Dictionary. [online] [dictionary.cambridge.org](https://dictionary.cambridge.org/dictionary/english/degradation). Available at: <https://dictionary.cambridge.org/dictionary/english/degradation>.
- Cambridge Dictionary (n.d.). FOOD SECURITY | meaning in the Cambridge English Dictionary. [online] [dictionary.cambridge.org](https://dictionary.cambridge.org/dictionary/english/food-security). Available at: <https://dictionary.cambridge.org/dictionary/english/food-security>.
- Cambridge Dictionary (2019b). HOSPITALITY INDUSTRY | meaning in the Cambridge English Dictionary. [online] Cambridge.org. Available at: <https://dictionary.cambridge.org/dictionary/english/hospitality-industry>.
- Cambridge Dictionary (2024). household. [online] @CambridgeWords. Available at: <https://dictionary.cambridge.org/dictionary/english/household?q=Household> [Accessed 22 Oct. 2024].
- Cambridge Dictionary (n.d.). POLYMER | meaning in the Cambridge English Dictionary. [online] [dictionary.cambridge.org](https://dictionary.cambridge.org/dictionary/english/polymer). Available at: <https://dictionary.cambridge.org/dictionary/english/polymer>.
- Commonshare. (2023). Frumat: The Apple Leather Slowly but Surely Replacing Conventional Leather. [online] Available at: <https://news.commonshare.com/blog/frumat-the-apple-leather-slowly-but-surely-replacing-conventional-leather> [Accessed 27 Oct. 2024].
- Debnath, S. (2015). Pineapple Leaf Fibre—A Sustainable Luxury and Industrial Textiles. *Handbook of Sustainable Luxury Textiles and Fashion*, pp.35–49. doi:https://doi.org/10.1007/978-981-287-742-0_3.
- Debnath, S. (2016a). Natural Fibres for Sustainable Development in Fashion Industry. *Sustainable Fibres for Fashion Industry*, pp.89–108. doi:https://doi.org/10.1007/978-981-10-0522-0_4.

- Debnath, S. [2016b]. Unexplored Vegetable Fibre in Green Fashion. *Green Fashion*, pp.1–19. doi:https://doi.org/10.1007/978-981-10-0245-8_1.
- Dierckx de Casterlé, B., Gastmans, C., Bryon, E. and Denier, Y. [2012]. QUAGOL: A guide for qualitative data analysis. *International Journal of Nursing Studies*, [online] 49(3), pp.360–371. doi:<https://doi.org/10.1016/j.ijnurstu.2011.09.012>.
- El Bilali, H. and Ben Hassen, T. [2020]. Food Waste in the Countries of the Gulf Cooperation Council: A Systematic Review. *Foods*, 9(4), p.463. doi:<https://doi.org/10.3390/foods9040463>.
- Ellen MacArthur Foundation [2017]. Circular Economy Introduction. [online] Ellen MacArthur Foundation. Available at: <https://www.ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview>.
- Hur, E. and Cassidy, T. [2019]. Perceptions and Attitudes Towards Sustainable Fashion design: Challenges and Opportunities for Implementing Sustainability in Fashion. *International Journal of Fashion Design, Technology and Education*, [online] 12(2), pp.208–217. doi:<https://doi.org/10.1080/17543266.2019.1572789>.
- Kennedy, L., Safi, S., Osaili, T.M., Ala Al Rajabi, Alblooshi, A., Dima Al Jawarneh, Ahmed Al Kaabi, Fakhra Al Rubaei, Maitha Albreiki, Alfadli, M., Aseilah Alhefeiti, MoezAllIslam Ezzat Faris, Kholoud Allaham, Sameeha Junaidi and Moien AB Khan [2024]. The attitudes and practices of United Arab Emirates consumers towards food waste: A nationwide cross-sectional study. *F1000Research*, 12, pp.911–911. doi:<https://doi.org/10.12688/f1000research.135678.2>.
- Lamba, M. [2021]. Using Artificial Intelligence to Reduce Food Waste in United Arab Emirates. [online] papers.ssrn.com. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3957401.
- Maryam Ali AlShamsi and Aljaradin, M. [2023]. Towards Sustainable Food Waste Management in the Hospitality Sector of Ajman, UAE: A Step Towards Achieving SDGs. Zenodo [CERN European Organization for Nuclear Research]. [online] doi:<https://doi.org/10.5281/zenodo.8286912>.
- Matthes, A., Beyer, K., Cebulla, H., Arnold, M.G. and Schumann, A. eds., [2021]. *Sustainable Textile and Fashion Value Chains*. Cham: Springer International Publishing. doi:<https://doi.org/10.1007/978-3-030-22018-1>.
- Orange Fiber. [2021]. Green Carpet Fashion Awards ▪ Orange Fiber. [online] Available at: <https://orangefiber.it/collaborations-special-projects-green-carpet-fashion-awards-2017/> [Accessed 27 Oct. 2024].
- Osail, T.M., Obaid, R.S., Alqutub, R., Akkila, R., Habil, A., Dawoud, A., Duhair, S., Hasan, F., Hashim, M., Ismail, L.C., Al-Nabulsi, A.A. and Taha, S. [2022]. Food Wastage Attitudes among the United Arab Emirates Population: The Role of Social Media. *Sustainability*, [online] 14(3), p.1870. doi:<https://doi.org/10.3390/su14031870>.
- Program, D., Arboritanza, L., Chiara, A., Karilene, B., Costa, R., Gheduzzi, S., Grasso, R., Gorzanelli, I., Rinaldi, S., Ruggeri, I., Succini, L. and Zedda, I. [2016]. The Ecological Turn Design, Architecture and Aesthetics beyond 'Anthropocene'. [online] Available at: https://air.iuav.it/bitstream/11578/317616/1/19_the%20ecological%20turn.pdf [Accessed 27 Oct. 2024].
- Provin, A.P., Dutra, A.R. de A., de Sousa e Silva Gouveia, I.C.A. and Cubas, e A.L.V. [2021]. Circular economy for fashion industry: Use of waste from the food industry for the production of biotextiles. *Technological Forecasting and Social Change*, 169(120858), p.120858.
- Purandare, S. and Patil, R. [2023]. HANDLE WITH ML: OPEN ENDED QUESTIONNAIRE FOR QUALITATIVE RESEARCH. [online] Available at: https://ijamrsd.com/wp-content/uploads/2023/04/JAMRSD-02-02-2023_3.pdf [Accessed 9 Aug. 2024].

- Reham Zeyad Sadeh and Bassam Abu Hijleh [2024]. Investigating the Food Waste Status in the Hospitality Sector of the Emirate of Dubai-UAE. Lecture notes in civil engineering, pp.182–189. doi:https://doi.org/10.1007/978-3-031-56121-4_18.
- Sachidhanandham, A. [2020]. Textiles from orange peel waste. *Science and Technology Development Journal*, [online] 23(2), p.First. doi:<https://doi.org/10.32508/stdj.v23i2.1730>.
- Samanta, K.K., Basak, S. and Chattopadhyay, S.K. [2016]. Potential of Ligno-cellulosic and Protein Fibres in Sustainable Fashion. *Sustainable Fibres for Fashion Industry*, pp.61–109. doi:https://doi.org/10.1007/978-981-10-0566-4_5.
- Stenton, M., Kapsali, V., Blackburn, R.S. and Houghton, J.A. [2021]. From Clothing Rations to Fast Fashion: Utilising Regenerated Protein Fibres to Alleviate Pressures on Mass Production. *Energies*, 14(18), p.5654.
- Thanh, N. and Hoang, M. [2019]. Consumer Perception and Behavior in the Context of Sustainable Fashion: A Comprehensive Analysis of Emerging Trends and Impacts. *Journal of Human Behavior and Social Science*, [online] 3(1), pp.1–14. Available at: <https://studies.eigenpub.com/index.php/jhbs/article/view/40/41>.
- Trimarchi, M. [2017]. Salvatore Ferragamo ▪ Orange Fiber. [online] Orange Fiber. Available at: <https://orangefiber.it/collaborations-ferragamo/>.
- United Nations [2024]. The 17 sustainable development goals. [online] United Nations. Available at: <https://sdgs.un.org/goals>.
- United States Environmental Protection Agency [2024]. Overview of greenhouse gases. [online] US EPA. Available at: <https://www.epa.gov/ghgemissions/overview-greenhouse-gases>.
- Yagoub, M.M., Al Hosani, N., AlSumaiti, T., Kortbi, O., Alshehhi, A.A., Aldhanhani, S.R. and Albedwawi, S.A. [2022]. University Students' Perceptions of Food Waste in the UAE. *Sustainability*, 14(18), p.11196. doi:<https://doi.org/10.3390/su141811196>.
- Yap, G. [2024]. For Rajoman, Rajo Laurel Reflects on Life and Loss. [online] Vogue Philippines. Available at: <https://vogue.ph/gallery/rajo-laurel-rajoman-bys-fashion-week-2024/> [Accessed 27 Oct. 2024].

