

# BUSINESS PLAN



*Lil Green Wear*  
look as bright as your future

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# Executive Summary

## Mission

We aim to develop and manufacture novel high quality bio-based and biodegradable polyester textiles to supply clothing manufacturers and move towards an environmentally-friendly and sustainable future while satisfying the high demand for apparel in Singapore.

## Solution Summary

In this modern day and age, materials used for the manufacture of apparel have mainly been synthetic polyesters that involve many raw materials such as crude oil. This makes the fashion industry extremely detrimental to the environment.

Therefore, Lil Green Wear focuses on the research and development of biodegradable and durable polyesters involving a novel technology which provides cost-competitive yet highly environmentally sustainable materials for apparel use. This novel technology that can manufacture plastics from plant-based sugars can be more cost-effective and their biodegradability allows us to close the loop of our textile life cycle.

## Investment

Lil Green Wear Pte. Ltd. is a start-up company focusing on R&D, headquartered in Singapore. According to studies on Polyethylene Furanoate (PEF) materials, the PEF market is expected to grow at 31% from 2019 to 2025 after its commercialisation, which can be in the form of textiles, packaging, fibres and films.<sup>1</sup> For the development of our bio-based material R&D programme, we would like to request for \$500,000 for a 20% equity stake in our company. A break-even analysis is estimated to be within 1 year of sales. There are also exit strategies available for investors in the event of a pull-out.



**Figure 1:** Solution summary of Lil Green Wear

# Company Summary

## Lil Green Wear



**Figure 2:** Official Logo for Lil Green Wear

Lil Green Wear was founded in 2020 by Linda Bijlard. Noticing the massive impact of environmental pollution caused by the fashion industry, the founders spotted an opportunity in a potential market within Singapore to perform R&D of PEF, a 100% bio-based material made from plant sugars that can directly replace PET, an important plastic, used in many aspects of our daily life.

The company name, Lil Green Wear, comes from aspirations to amplify little environmental efforts from each of us to make a great impact on the environment. We

hope to develop textiles and clothing of matching, if not superior quality to the current commercial source of textiles, to significantly reduce carbon foot-print in daily life. This way “green-ifying” more and more of our daily-used items like school uniforms. Lil Green Wear could offer a fashionable yet impactful channel for everyone to play a part in conserving our environment regardless of age or status. Thus, making you look as bright as your future.

The logo of Lil Green Wear symbolizes how the fate of the environment can be made better simply by what we choose to wear. In our hands, we hold the key to plant-based apparel that is environmentally sustainable. We seek to promote this concept in hopes that our customers and investors can join us in choosing to be responsible for the future.

## Company Structure

My name is Linda Bijlard, CEO of Lil Green Wear. Over the course of this business, other roles will be appointed to new employees. Figure 4 outlines some of the possible future roles for new employees of the company.



**Figure 3:** Company Structure

Position	Role
Chief Executive Officer (CEO)	<ul style="list-style-type: none"><li>● Making major corporate decisions</li><li>● Managing the overall operations and resources of a company</li><li>● Delegation of management responsibilities to others regarding marketing strategies</li></ul>

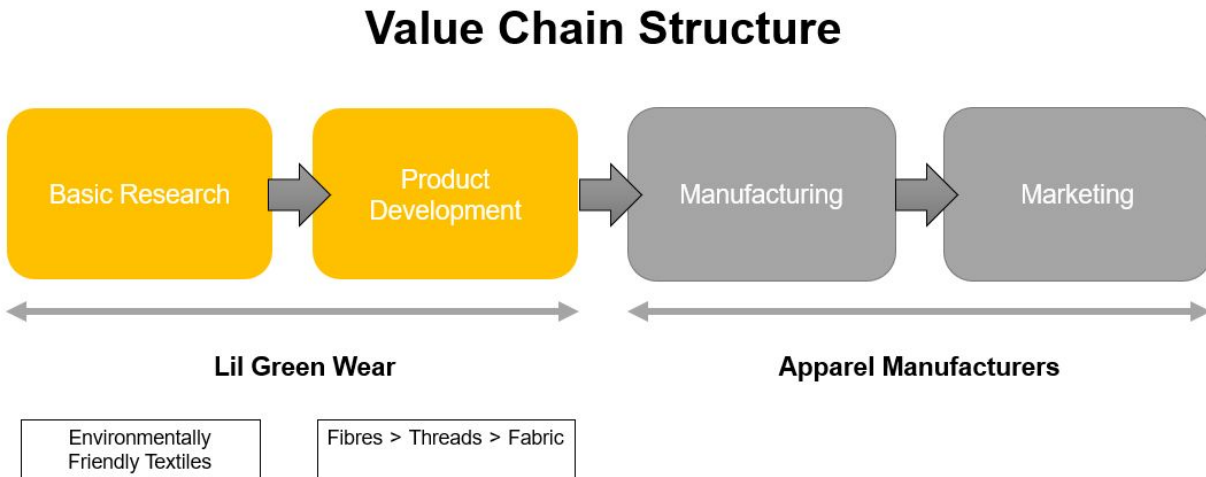
Chief Technical Officer (CTO)	<ul style="list-style-type: none"> <li>● Selection of emerging marketable technologies and develop strategies to remain relevant.</li> <li>● Focuses on customer-oriented products that can increase revenue.</li> <li>● Collaborate with the engineering team to ensure smooth operations.</li> </ul>
Chief Operating Officer (COO)	<ul style="list-style-type: none"> <li>● Oversee daily administrative and operational functions of the business</li> <li>● Design operational strategies</li> </ul>
Chief Marketing Officer (CMO)	<ul style="list-style-type: none"> <li>● Set marketing goals and objectives</li> <li>● Plan, implement and manage marketing strategy.</li> <li>● Contribute to the overall growth of the company.</li> <li>● Works with sales and development and customer success teams.</li> </ul>
Chief Business Development Officer (CBDO)	<ul style="list-style-type: none"> <li>● Facilitate business growth by working together with clients as well as business partners (through customer and market definition).</li> <li>● Drive prospects through to contract awards (including identifying new customers and markets, developing approaches to the market, identifying prospects, proposal preparation, etc.)</li> <li>● Develop Applications and other Systems.</li> </ul>
Chief Financial Officer (CFO)	<ul style="list-style-type: none"> <li>● Manage the financial actions of Lil Green Wear by tracking cash flow, writing a financial plan</li> <li>● identifying our company's financial strength and weakness and then coming up with methods to boost our strength while reducing or correcting our weaknesses.</li> </ul>

**Figure 4:** Roles of Key Positions in Lil Green Wear



## Business Model

Lil Green Wear will establish business locally through different stages. Focusing on a B2B model, catering to industrial partners such as school uniform manufacturers by offering PEF textiles and other environmentally friendly textiles produced from our R&D efforts (Figure 5).



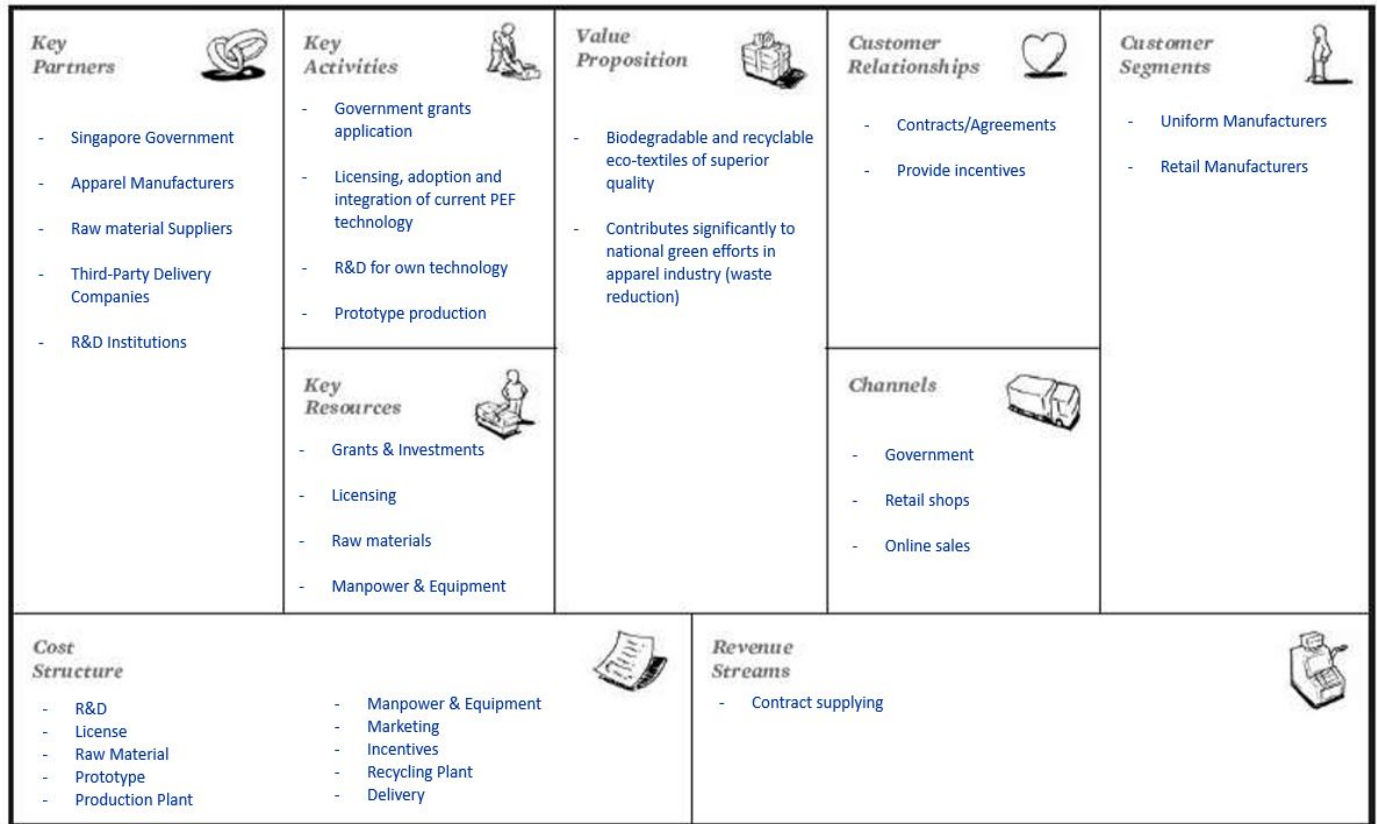
**Figure 5: Value Chain Structure**

Lil Green Wear has specific short-term and long-term goals matching our company's mission and vision to pave the way for future direction as shown in Figure 6.

Short-term goals	Long-term goals
License our technology from Avantium to manufacture PEF fibers into the market  Undergo R&D for future creation of our own technology	To be the leading fiber manufacturer for apparels in Singapore
Distribution of PEF fibers to clothing manufactures	Aim to make at least 80% of Singapore's apparel wear environmentally-friendly
Garnering support and subsidies and/or grants from the government	Explore other possible markets Lil Green Wear can penetrate

**Figure 6:** Short-term and Long-term goals of Lil Green Wear

In order to achieve both our short-term and long-term goals, strategies in 3 different stages are implemented (Stage I to Stage III), to be rolled out over a period of at least 9 years (from 2020 to 2029). Figure 7 summarises Lil Green Wear's key characteristics in a business model canvas.



**Figure 7: Lil Green Wear's business model canvas**



# Product

## Problem

The fashion industry is one of the major polluting industries. It is known to be responsible for about 10% of the greenhouse gas emission worldwide (more carbon emissions than the aviation and shipping industries combined), but it is also under fire for polluting the ocean with microplastics. About 60% of clothing materials are made of plastics, including polyester, acrylic and nylon textiles.<sup>2</sup> According to Tecnon Orbichem, a chemical data company, they predicted that the production of polyester would triple in amount per annum between 2007 and 2025.<sup>2</sup>

With a soaring demand, the amount of clothes disposed of increases significantly and negatively impacts the environment, where 85% of all these textiles will eventually end up in landfills every year. Research shows only 6% of textile wastes are recycled.<sup>3</sup> This is especially worrying as the starting petroleum materials for synthetic polyesters is also a growingly finite resource. Singapore's small land area further spells out the urgency for a solution.

Therefore, apparel companies are now expected and pressured into bearing the responsibility of lowering the environmental risks of such commercialised production processes. Singapore, acclimated to being the greenest city in Asia and the fourth greenest city of the world, does not readily offer a sustainable alternative for apparel yet.

## **Solution**

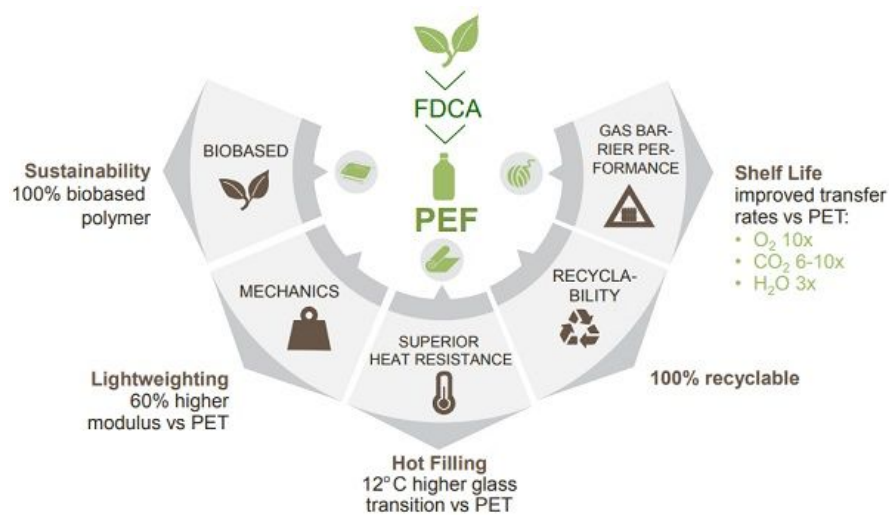
Currently, millennial generations with purchasing power have high expectations and greatly favour businesses that operate sustainably.<sup>4</sup> Spotting the current trend and with consideration to the local context, Lil Green Wear aims to cater this demand with the development of bioplastics to replace the polyester content in apparel. It is the refreshment Singapore needs, starting with broadening the options available in the prevalent market that is apparels. Bioplastics are currently recognised as a key sustainable material in the 21st century by offering balance between environmental benefits and impact of plastics. Polyethylene 2,5-furandicarboxylate (PEF) is a polymer that highly resembles PET, which is one of the commonly used materials to manufacture fibers for clothing.

Lil Green Wear aims to license and adopt the technology of the bioplastic PEF production from a leading chemical company, called Avantium, in the Netherlands while carrying out R&D in Singapore to reduce dependence on the company. Furthermore, one of the main channels we aim to obtain our raw materials from, comes from food waste, from which only 17% was recycled in 2018. This is in line with Singapore's efforts in achieving the 3Rs, which can help us in securing positive support of customers and financial support of the government with a grant with regards to sustainability.

## Unique Selling Proposition

Our company selected Polyethylene Furanoate (PEF) due to its superior barrier, mechanical and thermal properties. Currently in the Singapore apparel market, there is a lack of eco-friendly textiles able to integrate into current PET recycling streams and meeting cost expectations without negative impacts.

We pride ourselves in providing superior quality eco-friendly textiles at affordable prices with maximal benefits for everyone. Conversion of industrial wastes into valued products within a closed lifecycle loop.



**Figure 8: Superiority of using PEF**

## Competitor Analysis

There are currently no direct competitors of eco-friendly textiles in the apparel industry in Singapore. This may be due to the many challenges faced by green suppliers and manufacturers. Most green suppliers and manufacturers struggle to keep up with environmental commitment especially when there is high investment and low return involved in green initiatives. This could be the biggest deterrence faced by our predecessors. Green business may not be economically beneficial in the short-term. Therefore, only organisations with stronger financial capabilities are able to rise up and reap long term benefits from the collaboration.

Here are common crucial barriers of entry for green textiles in Singapore

1. Absence of reward system
2. Lack of new technology, materials and processes
3. Lack of economic benefits
4. Reluctance of support by supply chain partners

Our competitors generally offer lower priced textiles and the manufacturing processes are situated in lower-wage countries compared to Singapore such as Malaysia, Indonesia and China. However, they bring about substantial pollution with the current source of textiles derived from cotton and polyester. Importantly, financial incentives can be a good reward system from the government body to encourage suppliers in taking initiatives towards green management (Ghazilla et al., 2015). Based on our survey (see appendix), the end consumers are typically willing to pay a little more for green products and services.



## **Competitive Advantages**

Our company will position our products on a 'More for More' basis. We will provide superior quality textiles from a licensed technology, using current horticulture wastes in Singapore. Concurrently, we will work towards being self-sufficient by performing continuous R&D on other eco-friendly materials. By converting wastes into valuable products, Lil Green Wear will be able to manufacture in the long run, in terms of supply and demand as millennial generations with purchasing power will have high expectations that greatly favours businesses operating sustainably. There are many massive apparel brands such as H&M, Gap, ASOS and Arcadia who have signed up to "Fashion Love by Forest", a non-profit environmental group which commits companies to using fabrics without deforestation. These major players in apparel and footwear serve as good partners to collaborate with for PEF materials to infiltrate, ideal for each of their environmentally sustainable missions.

## Critical Success Factors



### 1) Strong Support from the Singapore Government

It is crucial for the Singapore Government to spearhead movements towards environmental friendliness. The required supportive actions are in the form of grants and green legislation to keep our business ecosystem intact. Encouraged selection of PEF textiles with long-term contracts by apparel manufacturers with headquarters based in Singapore will be acquired with this.

### 2) Quality Assurance and Cost Effectiveness

Assurance of quality must be demonstrated to all parties. Supporting evidence from Avantium can be located for relevant use. Prototype production with the licensed technology and evaluation of production processes in our textile factories can be assessed for further supplementation.

### 3) Positive Ecosystem Impacts and Recyclability

Implementation of PEF into local recycling facilities handling PET should be tested. Negative impacts should not be demonstrated in this process. This factor will differentiate us from other textile producers.

### 4) Continuous R&D for optimisations or inventions of novel technologies

Sustaining continuous pursuit of R&D in environmentally friendly materials is crucial for our company to stay ahead in the textile industry. Therefore, innovating textiles with desirable qualities, affordability and recyclability forms an important criteria in the survival and growth of our business.

# Market Analysis

## Industrial Examination

The PEF market was valued at USD\$167.9 thousand in 2017, expected to reach USD\$129.3 million by 2025.<sup>5</sup> Upon commercialisation, an approximate 30% growth of the PEF market value from 2019 to 2025 have been predicted.<sup>5</sup> PEF is used mainly in bottle packaging, film and fiber productions, especially with the hopes of evolutionalising the global packaging industry. It is an area of high interest for investments by manufacturers and distributors across a variety of markets and the most dominant in Europe, Asia-Pacific (APAC) and North America, as demonstrated by the patents applied by many chemical companies. Currently, a number of companies such as Coca Cola, Danone and Nestle S.A. have implemented PEF bottles into their operations. Chemical companies like Avantium, Avalon and Synvina are taking initiatives toward promoting PEF usage. For example, PEF bottles are promoted at international events such as the Tokyo Olympics 2020. Given the wide applications of PEF, there is great potential for it to enter even more markets once the costs are optimised.

Lastly, since PEF has not reached a stage of widespread commercialization, PEF tends to cost more when compared to PET.<sup>5</sup> However, it remains hopeful that prices can be significantly reduced once PEF production enters commercial and industrial stages for large scale production.

## **Target Market**

We aim to target the big apparel companies in Singapore such as Adidas and Nike. This is a huge market we can sell our products to since they are recognized internationally. Adidas and Nike are moving their factories to ASEAN countries such as Vietnam, which is near to Singapore.<sup>6</sup> This makes them a strategic client to us.

## **Market Size**

Apparels have a huge market size, amounting to more than USD \$2 million in 2020. The market is expected to grow annually by 1.8%.<sup>7</sup> By targeting higher end brands such as Adidas and Nike, we will be able to penetrate the market at a high rate due to their want to be the pioneers in sustainable fashion. As such, we would expect our market volume and market value to be higher than most start-ups.

## SWOT Analysis

<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Our textiles are biodegradable, recyclable and environmentally sustainable. Closed product life cycle loop.</li> <li>• Compatible with PET facilities, save cost on equipment</li> <li>• Adopting licensed technology from renowned company Avantium with patented technology in Singapore</li> <li>• Trained and knowledgeable personnel, helps to enhance our own R&amp;D processes</li> </ul>	<p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• No presence or reputation in the market</li> <li>• Dependence on licensed technology</li> <li>• Possible increased prices</li> <li>• Possible funding problems</li> <li>• Initial high costs</li> <li>• Difficulty in obtaining raw materials</li> </ul>
<p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>• Government grants and support our venture</li> <li>• Government support can reduce the barrier of entry into the uniform industry in Singapore</li> <li>• Set up path for our market penetration using other's technology</li> <li>• Easier market penetration in Singapore due to emphasis on national green efforts (presence of imminent waste problems and limited space)</li> <li>• Apparel is always in high demand, the role of the government is crucial in initiating change</li> <li>• Chance of getting promotions through the press and media</li> </ul>	<p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• Lack of government support will impede our company growth (lack of recommendations, regulations, enabling incentives for our customers)</li> <li>• Increased media attention can draw more competitors to imitate our product</li> <li>• Limited to the duration of the license from Avantium</li> <li>• If R&amp;D fails, sole reliance on licensed technology prevents company growth</li> <li>• Possible unattractive perceptions of incentives provided for the customers</li> <li>• General negative public attitude towards our new idea if the textile does not possess promised qualities</li> </ul>

	<ul style="list-style-type: none"> <li>• Unwillingness for apparel manufacturers to switch to our textiles</li> </ul>
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## Critical Risks

One of the critical risks is the sole dependence on the licensed technology, especially in the case of yet-to-succeed R&D efforts. To reduce reliance on a single company, there are other potential companies (e.g. Avalon, Corbion) to license similar technology as well. Having a strong research base in Singapore's research institutions will also help us to alleviate this potential risk. In order to gain confidence from the manufacturers, we are adopting a step-by-step business plan, from R&D to producing our first prototype for our investors and potential customers, which will help to garner attention in our product to be used in the market for Singapore.

Next, possible media attention for the use of this technology may draw upon competitors, especially since Avantium has not applied for a patent in our expected country of operation, Malaysia. The entry of potential competitors may also affect our dominance in the market, especially those with better quality products that are more cost-effective. Therefore, improvements to our efficiency has to be done.

Lastly, the presence of Singapore governmental support is the greatest risk of all as it is the largest push factor in our business and there is a dependence on the government to roll out incentives to encourage the uptake of eco-friendly textiles. Nevertheless, licensing from a renowned company such as Avantium will increase confidence of the government to support our movement, for manufacturers to employ our services of providing eco-textiles, for investors to believe in the feasibility of our employed technology and end-consumers to believe in our products.

# Marketing Strategy

## 3Ps - Price, Place, Promotion

### Price

Our product will be following the value-based pricing model. There will be a slightly higher mark-up to match the perception of better quality textiles as well as considering licensing costs to be recovered over a period of time towards breaking even. From results collected from the survey, many Singaporeans have a desire to contribute to saving the environment and are willing to pay a higher price for school uniforms. We think that it is a good strategy to set a higher psychological price so that consumers perceive that the product takes care of the environment and feel like they are acting in an environmentally sustainable way with their decision to pay a higher price. This can help to build customer loyalty to our fabrics or materials, thus having an interest in us. As for textile delivery, we will employ basing-point pricing to adjust delivery costs to benefit us and our customers.

## Place

Our headquarters handling the sales will be positioned in Singapore with textile stocks sent directly from our textile production factories positioned in other countries. This allows us to spread our product geographically for more accessibility for our customers. The fact that we are based in Singapore allows us to respond quickly to market demand and also gives us the possibility to have well-educated staff who can promote the quality of the product. This will also allow us to test the different discoveries more efficiently. Apart from our retail manufacturers, we will have an online platform where customers can make purchases for our product. Live chat functions will be available for clarification of any queries for quotations or regarding the product. Our decision to sell products online allows us to map consumers, observing their geographical location and where the areas of greatest interest are, in order to observe consumer preferences and understand which areas to develop more. Buying online also allows us to avoid large inventories, so that uniforms can always be updated and in such a way that we pursue our interest in the environment so that we do not waste. We will also create an application that allows us to update our customers on different innovations and new products. Within the application, all the processes of product creation, care and respect for the environment will be shown to our customers.



### Promotion

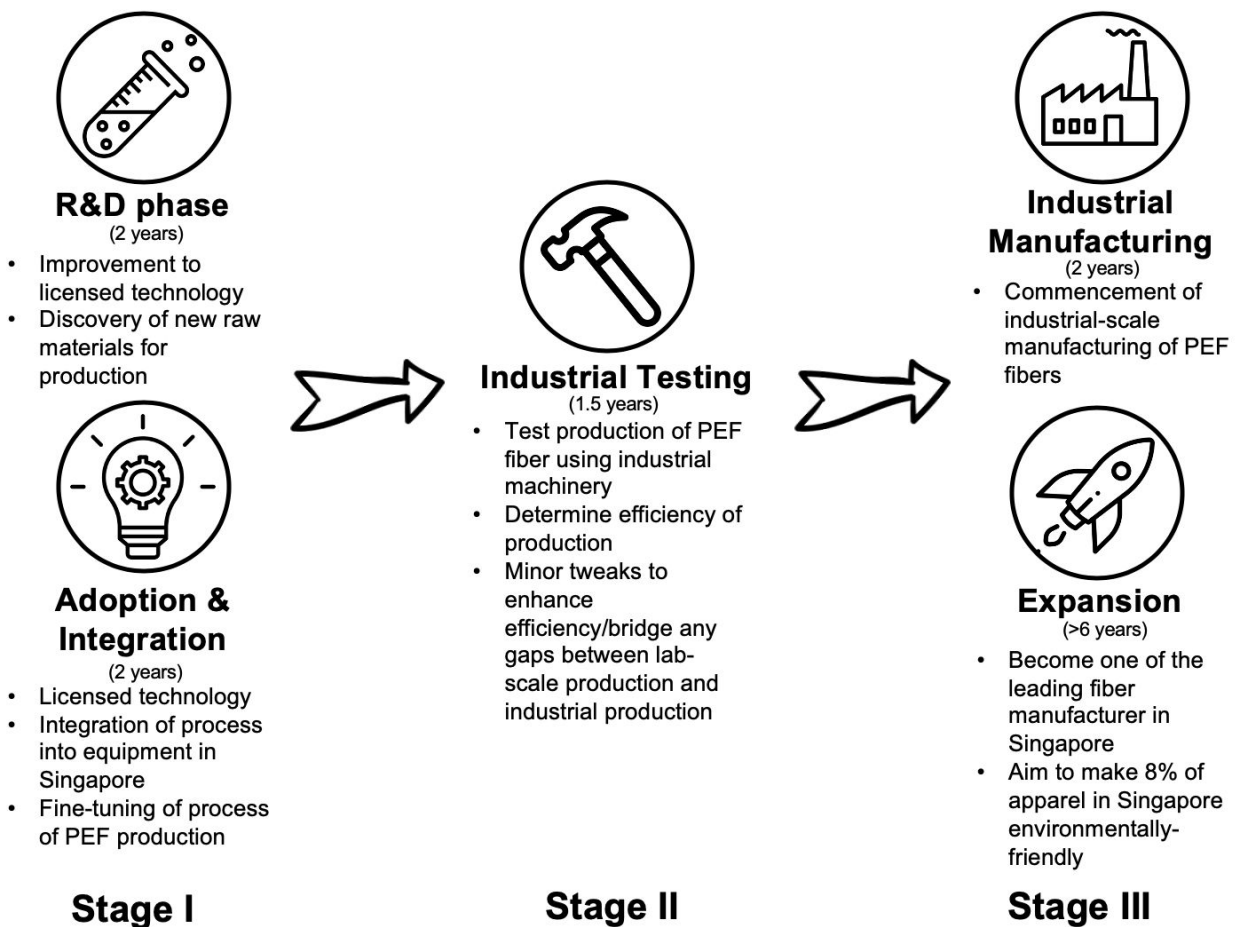
Our marketing plan includes the use of social media (e.g. Facebook, Instagram and LinkedIn). This is to update our potential customers as well as to build customer relationships by getting them to subscribe to our beliefs of making a greener environment. This will give initial visibility of the product and to make our customers aware of this completely new product.

Being a niche market, we thought it is essential to build up the loyalty of possible customers, so it is essential to create a direct relationship with them, so that they can ask us their questions directly in person. We intend to send representatives to potential manufacturers to promote our products. Our representatives will have samples of our textiles to demonstrate the product in a consistent way. Once purchased through the representative or online, the product will be delivered directly to the manufacturers.

# Operational Plans

## Product Development and Production

Figure 9 below shows our idea for product development and production, occurring in 3 stages and taking a period of about 6 years, excluding the expansion phase.



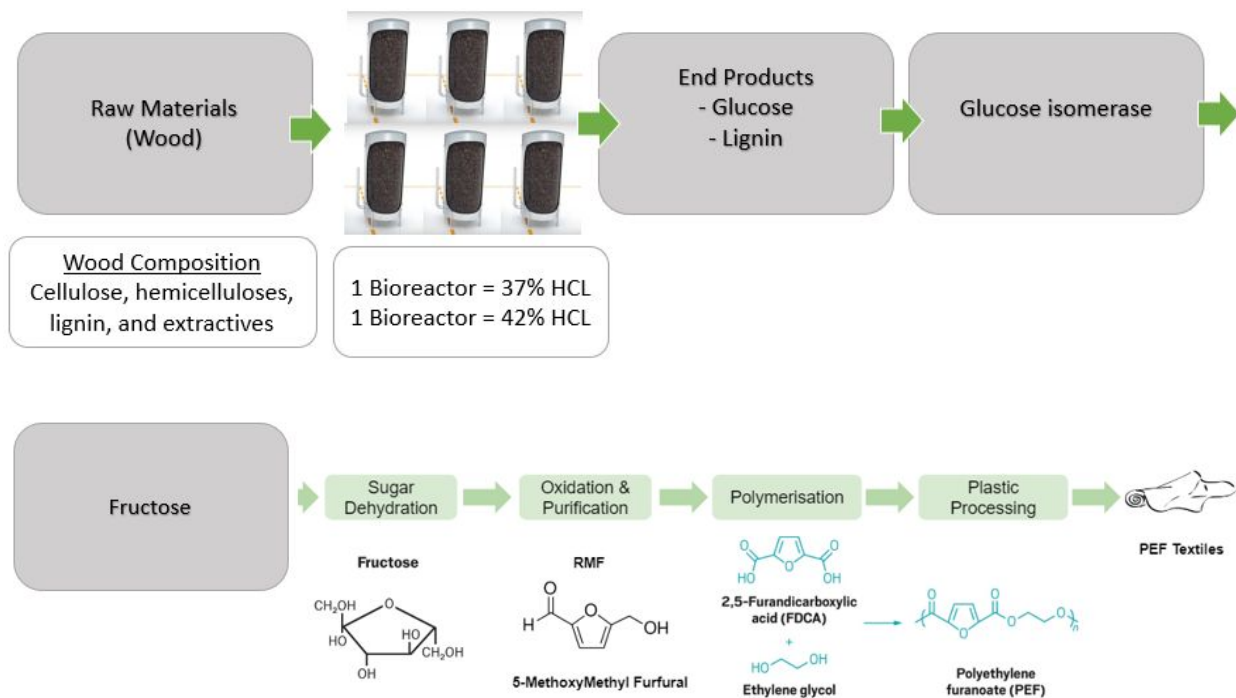
*Figure 9: Overview of business progression*

## Materials

As we plan to set up our factory in Singapore, we looked at possible plant-based feedstocks available for the YXY technology. According to the National Environment Agency (NEA)'s waste statistics, in Singapore, more than 130,000 tonnes of wood and 150,000 tonnes of horticulture are being disposed of in 2018.<sup>8</sup> In Singapore, horticultural wastes are generated from tree trunks and branches during the pruning processes as maintenance of trees and plants. They are sent to recycling companies for conversion into wood chips which can be employed for our use. As wood contains 25% of lignin and 25% of hemicellulose, it would make a good raw material to be used as precursors to the YXY technology (see Technology section).<sup>9</sup>

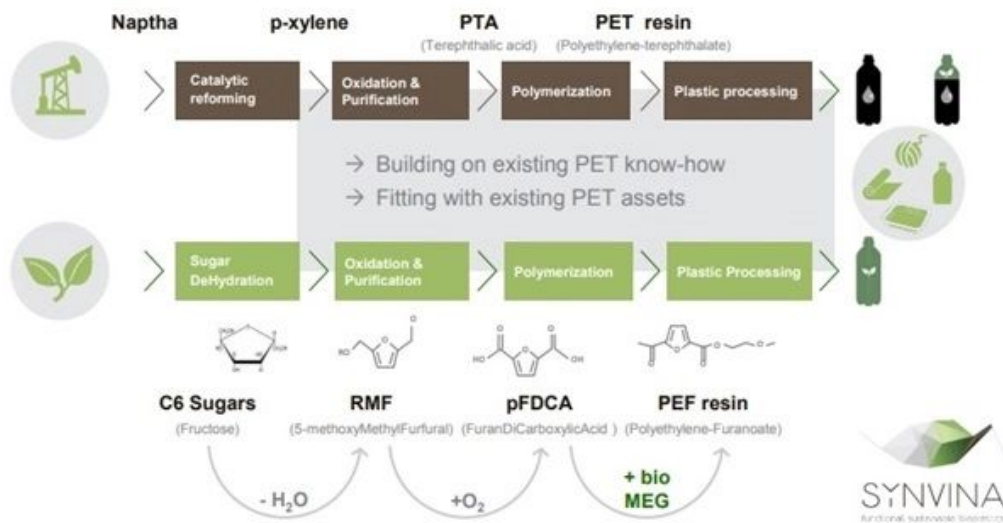
Another possibility could be food wastes as more than 636,000 tonnes of food waste is generated in Singapore in 2018.<sup>10</sup> We can sieve through food waste which is plant-based to be used as our raw material to produce FDCA.

## Technology



**Figure 10:** General workflow of converting sugarcane wastes into PEF textiles

Avantium's YXY technology is known as a 'plants-to-plastics' technology resulting from the catalytic conversion of plant-based sugar (fructose) into a variety of plant-based plastics such as PEF while the conventional PET is derived from petroleum sources. The precursor of PEF is furandicarboxylic acid (FDCA), a material researched for over a decade without desirable outcomes until now.<sup>11</sup> The figure below compares the production process of PEF and PET. PEF focuses on building on PET fundamentals and utilisation of PET equipment.



**Figure 11:** Comparison of PET and PEF production processes

## Locations & Facilities

For our R&D, we would require a research space which will be able to provide quality research and experimental facilities in order for us to test our technology and further improve on it.<sup>12</sup> Furthermore, eligible small-medium enterprises (SMEs) can receive up to 50% grants from Enterprise Singapore,<sup>13</sup> bringing daily rental to SGD\$550 instead.

Purpose	Location	Reasons for choosing	Price (SGD) per day
Research & Development	Agency for Science, Technology and Research (A*STAR)	<ol style="list-style-type: none"> <li>1. <b><u>Excellent biotechnology and equipments</u></b></li> <li>2. Allow us to <b><u>test</u></b> our technology and <b><u>further improve</u></b> on it</li> <li>3. Research space for <b><u>development</u></b> of usage of <b><u>other raw materials</u></b> for production of FDCA and PEF</li> </ol>	\$ 1,100.00

**Figure 12:** Details of choosing A\*STAR as a R&D space

An office would be required to help facilitate administrative processes such as order taking and expansion plans. Due to the small size of the start-up, we do not require a huge office space as we will not require many staff members.<sup>14</sup>

Purpose	Location	Reasons for choosing	Price (SGD) per month
Office	Paya Lebar Square, Singapore	<ol style="list-style-type: none"> <li>1. Small size of 150 sq ft, <b><u>sufficient space</u></b> for 4-6 people to work</li> <li>2. <b><u>Fully fitted</u></b> with furnitures, zero renovation costs</li> <li>3. Right beside MRT station, <b><u>convenience</u></b> of travelling to and fro work</li> </ol>	\$ 1,350.00

**Figure 13:** Details of choosing an office at Paya Lebar Square, Singapore as a headquarter

A factory would be required to allow our company to produce PEF fibers for a start, which will then be sold to clothing manufacturing companies. As we will be receiving grants from the Singapore government, we will be setting up our factory in Singapore.

Purpose	Location	Reasons for choosing	Price (SGD) per month
PEF fiber production	Factory in Pandan Crescent, West Coast, Singapore	<p>1. Measres 8000 sq ft, which allows more than <b><u>sufficient space for our machines</u></b></p> <p>2. Large space also allows <b><u>storage of inventories</u></b>, saving cost of renting a warehouse</p> <p>3. Cargo lifts and loading bays allowing ease of loading machines and inventories</p> <p>4. <b><u>Accessibility</u></b> to expressway, <b><u>facilitating delivery</u></b> of machines &amp; fibers, and allow <b><u>convenience for staff</u></b> to travel to and fro work</p> <p>5. Partially fitted, reducing costs of renovation</p> <p>6. <b><u>Close</u></b> to research space at A*STAR, allowing convenience in testing new technologies</p>	\$ 15,000.00

**Figure 14:** Details of choosing a factory in Pandan Crescent, Singapore to produce PEF fibers

A delivery service would be required to help transport our PEF fibers from Singapore to other garment manufacturing factories in other parts of Asia, such as Indonesia, Vietnam and Malaysia, where apparel giants have set up their factories.<sup>15</sup> **DHL** would be an ideal choice as it is able to deliver shipments up to 1000 kg worldwide, which would help us reach out to our clients who have set up their factories in various countries.<sup>16</sup> The rate is SGD\$12.20 per kilogram.

## Equipment

Before production of PEF fibers, the raw materials would first have to be converted to FDCA, which would require a list of equipment (see Appendix) to achieve.

Our company would require specialized technology in order to set up a production line manufacturing our PEF fibers. PEF fibers can be manufactured using machines manufacturing PET fibers.<sup>17</sup> Machines required can be purchased from sites like Alibaba.com, which offers both second-hand and brand new machines at lower prices. The list of machines that would be essential in the manufacture of PEF fibers is shown in the appendix. The entire production line, able to produce 20 tons of fiber per day, will be purchased from Alibaba.com, costing us about USD 900,000 per set.<sup>18</sup> Furthermore, overseas installation, operation training as well as reasonable spare parts and maintenance cost would also be included. This would allow our staff to have specialized training for machinery operation, and future costs in maintaining our machinery would be kept low.

For quality control, we would require specific equipment to aid our PEF fiber quality checks. The table in the appendix shows the list of equipment we would require and their usage.

A forklift (SGD\$227.82) would be useful in transportation of packaged PEF fibers to the stocks, or for transportation to the delivery van.<sup>19</sup>



## Personnel Requirements

To ensure sufficient manpower overseeing important processes in the production line hence ensuring smooth operation, our company foresees about 10 staff (inclusive of supervisor and technician) working at any one time. This is modelled after Avantium's flagship plant, which created employment for over 60 people,<sup>20</sup> as well as the average of 35 employees working in a manufacturing plant.<sup>21</sup>

Personnel Title	Job Description	Quantity of personnels	Pay in SGD (per month)
Factory workers	1. Operate factory machinery producing PEF fibers 2. Stationed at major checkpoints in production line to ensure smooth operations 3. Pay attention to details and raise any issues regarding machines to supervisor 4. Adjustment of machine settings	6	\$ 1,200
Quality control Inspectors	1. Ensure that PEF fibers produced are in the best quality and ready to be sold 2. Pick out even the slightest defect 3. Ensure effective and efficient testing of PEF fibers 4. Help in transportation of packaged fibers to where stocks are kept	2	\$ 1,100
Factory supervisor	1. Smooth operation of factory manufacturing process 2. Pay attention to details to observe any issues, and resolve them quickly 3. Partner with technician to ensure smooth running of machines at all times	1	\$ 1,500
Technician	1. Ensure that the machines are in peak working condition at all times 2. Perform routine maintenance on the machines 3. Help repair machinery that are spoilt	1	\$ 1,900
Administrative Executive	1. Take care of all administrative workload (e.g. organizing paperwork, payroll, etc)	1	\$ 1,800
Sales Executive	1. Meet with potential clients to sell our fibers to them 2. Analysis of key metrics to help grow our business 3. Coordinate delivery to clients	1	\$ 2,800

\*All salaries are based on average salaries from Glassdoor. .

**Figure 15: List of Personnels Required for PEF Production**

To reduce costs of our company due to its small size, the role of administrative executive and sales executive will be done by the founders in the beginning.

Avantium's flagship plant plans to manufacture 5000 tons of FDCA and PEF fibers per annum<sup>42</sup>. Due to the small size of our start-up initially, the production size of about 1000 tons per annum is considered sufficient,<sup>22</sup> with plans to increase production slowly in order to reach full efficiency of our production line. Hence, we would propose for the factory to operate about 8 hours daily, 5 days a week, to allow a steady amount of PEF fibers that could be manufactured. Research has shown that it takes approximately 4.8kg of cotton yarn to be manufactured into a T-shirt,<sup>23</sup> meaning that our daily operations can lead to the production of about 510 T-shirts.

## Licensing and Regulations

Firstly, we would have to set up our business with the Accounting and Corporate Regulatory Authority of Singapore (ACRA) as a private limited company due to the scalability of our company. Our company would be governed by the Singapore Companies Act.<sup>24</sup> The figure below shows the general flow in setting up a business in Singapore.

Step 1: <u>Choosing Business Entity</u>	Step 2: <u>Setting up company</u>	Step 3: <u>Opening a bank account</u>	Step 4: <u>Post registration activities</u>
<ul style="list-style-type: none"><li>• Register with ACRA as private limited company</li><li>• Shareholders not liable for debts and losses beyond share capital</li><li>• Company recognized as a taxable entity</li></ul>	<ul style="list-style-type: none"><li>• Must comply with laws of ACRA and IRA</li><li>• Company name approved by ACRA</li><li>• Minimum of one shareholder</li><li>• At least one director residing in Singapore</li><li>• Company Secretary (Singaporean)</li><li>• Paid up capital: at least \$1</li><li>• A physical office address</li></ul>	<ul style="list-style-type: none"><li>• Open a bank account in Singapore</li></ul>	<ul style="list-style-type: none"><li>• Applications for licenses/permits</li><li>• Register office hours</li><li>• Custom registration for import/export of goods</li><li>• GST registration</li><li>• CPF registration</li></ul>

**Figure 16:** Details showing the procedure of setting up a business in Singapore

As we will be shipping to other Asian countries, we will be incurring import duties such as import tax, value-added tax (VAT) and special consumption tax (SCT).<sup>25</sup>

Employers in Singapore have to contribute 17% of an employee's monthly salary to their Central Provident Fund (CPF).

Personnel Title	Pay in SGD (per month)	Amount for employees' Provident Fund in SGD (per month)
Factory workers	\$ 1,200.00	\$ 204.00
Quality control Inspectors	\$ 1,100.00	\$ 187.00
Factory supervisor	\$ 1,500.00	\$ 255.00
Technician	\$ 1,900.00	\$ 323.00
Administrative Executive	\$ 1,800.00	\$ 306.00
Sales Executive	\$ 2,800.00	\$ 476.00

**Figure 17:** Amount of money payable to employees' provident fund (in yellow)

## Environmental Considerations

To assess the environmental impacts of products and processes of our operations, we will use life-cycle assessment.<sup>26</sup> It involves the complete lifecycle and end-of-life assessment ("cradle-to-grave" analysis).<sup>27, 28</sup> Additionally, textile fiber sustainability can be assessed by common tools like the Higg Materials Sustainability Index (MSI) and MADE-BY Fiber Benchmark.<sup>29</sup>

# Protection of Intellectual Property

## Current Plans

We will be licensing Avantium's YXY technology which has patents applied and granted in Singapore. Based on a press release, Avantium is keen on solidifying its position by licensing their YXY technology for industrial scale applications.<sup>30</sup> Avantium's SG patent may protect against commercial sale of other products made from similar PEF processes as Avantium. Alternatively, we may source for other chemical companies to license the PEF technology in the case where collaboration with Avantium fails.

Furanix Technologies (Avantium)	Countries Granted
Process for PEF preparations	
- WO2015137804	US, AUS, EP, <u>SG</u>
- WO2015142181	US
- WO2015137805	US, AUS, EP, <u>SG</u>
Applications in Fibres	
- WO2014204313	EP, <u>SG</u>

**Figure 18:** Patents applied by Avantium

Additionally, we will be applying for a trademark for Lil Green Wear's logo using the IP Blockchain and through the IP Office. A patent will also be applied subsequently to protect our developed technology from our R&D phase.

# Financial Plan

## Budgeting

According to our financial projections, Lil Green Wear is expected to maintain a healthy financial position. The following projected financial statements have been crafted in accordance with the general accounting principles, and necessarily include certain amounts that are based on reasonable estimates and judgements.

## Initial Expenditures Required

Expenses	Estimated Costs
<b>Set-up Costs (One-time fee)</b>	
PET Plant Production Line	\$ 1,300,000.00
Transport Equipment (Forklift)	\$ 227.82
Quality Control Equipment	\$ 8,500.00
Trademark	\$ 341.00
Business Filing	\$ 600.00
Licensing fee	\$ 250,000.00
<b>Total</b>	<b>\$ 1,559,669.00</b>

## Sales Projection

### Pricing Strategies

PEF fibre pricing is based on value-based pricing, with mark-up from existing PET fibre pricing available in the market as quoted on Alibaba.

			Polyester Market Pricing			Polyester Cost Pricing		
Fibre weight	2000	tons	PEF Mark-Up 70%			PEF Mark-Up 30%		
	1814000	kg	\$1.60/kg	\$2.72/kg	<b>\$2467.04/ton</b>	\$0.90/kg	\$1.17/kg	<b>\$1061.19/to</b>

### Estimated Sales

	Unit Sales (ton)	Sale Price/ton	Cost Price/ton	Profit Margin/ton	Total sales
Year 1	1000	\$2,467.04	\$1,061.19	\$1,405.85	\$1,405,850.00
Year 2	1000	\$2,467.04	\$1,061.19	\$1,405.85	\$1,405,850.00
Year 3	1000	\$2,467.04	\$1,061.19	\$1,405.85	\$1,405,850.00
				<b>Total</b>	<b>\$4,217,550.00</b>

This table was used to generate the expected sales and profit margins.



## Income Statement

Grants	Estimated Amount	
Enterprise Development Grant	\$2,256,749	70% grant (SMEs)
Startup SG Tech	\$250,000	Prove of Concept Project
Investments	\$500,000	
<b>Capital</b>	<b>\$3,006,749</b>	

<b>EDG</b>	<b>70%</b>
\$3,223,928	\$2,256,749

## Income Statement (Dated 13/4/2020)

	2020
<b>SALES</b>	\$2,467,040
<b>Less: COST OF SALES</b>	
Opening inventory	-
Raw Materials	<u>\$1,700,719</u>
Less: Closing inventory	-
<b>GROSS PROFIT</b>	<u>\$766,321</u>
<b>Less: OPERATING EXPENSES</b>	
<b>Operating Costs</b>	
Office Rent	\$48,600
Plant Rent	\$180,000
Utilities Fee	\$9,000
Manpower	\$159,600
Insurance	\$3,600
Marketing Fees	\$12,000
Delivery Services	\$11,065
Postage, Printing & Stationery	\$1,200
Telephone Subscription	\$2,400
<b>YXY Tech Royalties (10%)</b>	\$246,704
	<u>\$674,169</u>
<b>PROFIT BEFORE TAX</b>	\$92,152
Less: SG TAXATION (50% on next \$200,000)	\$0
<b>PROFIT AFTER TAX</b>	<b>\$92,152</b>





## **Income Statement Projection**

After 8 months of operations, we expect to be profitable with profits increasing over the next 4 months due to being more established and increasing our consumer base. The following table and chart display the income statement projection for the next 12 months.

### Income Statement Projection

[illegible]

Assume first 2 months is production of FDCA from raw materials, production of 100 tons per month for the next 10 months

[illegible][illegible][illegible][illegible]

## Cash Flow Projection

There are a number of profitable companies that went bankrupt due to cash flow deficiencies. Noting that, we aim to always have sufficient cash on hand to pay for any payments that need to be settled. Our financial projections show that Lil Green Wear is capable of generating positive cash flows and will be able to have sufficient cash flows. In preparation for any contingencies, we will establish sufficient cash reserves as a top up of normal cash inflow and outflow. Additionally, we can take a line of credit with a bank to be used during a low sales period so that cash flow risk is minimized. The projected excess cash will be invested in periods of high interest rates such as by purchasing government securities. The following table and chart display the projected cash flow for next 12 months.

**Cash Flow Projection**

Year 1	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Total
Sales Revenue	\$0	\$0	\$246,704	\$246,704	\$246,704	\$246,704	\$246,704	\$246,704	\$246,704	\$246,704	\$246,704	\$246,704	\$2,467,040
<b>OUTFLOWS</b>													
Raw Materials	\$170,071.88	\$170,071.88	\$170,071.88	\$170,071.88	\$170,071.88	\$170,071.88	\$170,071.88	\$170,071.88	\$170,071.88	\$170,071.88	\$170,071.88	\$170,071.88	\$2,040,862.56
Marketing	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$12,000
Manpower (including CPF)	\$15,561	\$15,561	\$15,561	\$15,561	\$15,561	\$15,561	\$15,561	\$15,561	\$15,561	\$15,561	\$15,561	\$15,561	\$186,732
Office Rental	\$4,050	\$4,050	\$4,050	\$4,050	\$4,050	\$4,050	\$4,050	\$4,050	\$4,050	\$4,050	\$4,050	\$4,050	\$48,600
Plant Rental	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$180,000
Delivery Services	\$0	\$0	\$922	\$922	\$922	\$922	\$922	\$922	\$922	\$922	\$922	\$922	\$9,221
Insurance	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$6,000
Depreciation	\$7,270.75	\$7,270.75	\$7,270.75	\$7,270.75	\$7,270.75	\$7,270.75	\$7,270.75	\$7,270.75	\$7,270.75	\$7,270.75	\$7,270.75	\$7,270.75	\$87,249
Utilities	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$18,000
Miscellaneous	\$1,300	\$1,300	\$1,300	\$1,300	\$1,300	\$1,300	\$1,300	\$1,300	\$1,300	\$1,300	\$1,300	\$1,300	\$15,600
YXY Tech Royalties (10%)	\$0	\$0	\$24,670.40	\$24,670.40	\$24,670.40	\$24,670.40	\$24,670.40	\$24,670.40	\$24,670.40	\$24,670.40	\$24,670.40	\$24,670.40	\$246,704
<b>Taxation</b>													
Singapore Tax (50% on next \$200,000)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Net Inflows (Outflows)	\$216,253.63	\$216,253.63	\$241,846.15	\$241,846.15	\$241,846.15	\$241,846.15	\$241,846.15	\$241,846.15	\$241,846.15	\$241,846.15	\$241,846.15	\$241,846.15	\$2,850,969.73
ADD Opening Balance	1971549	0	0	0	0	0	0	0	0	0	0	0	\$1,971,549
EQUAL Closing Balance	\$2,187,802.63	\$216,253.63	\$241,846.15	\$241,846.15	\$241,846.15	\$241,846.15	\$241,846.15	\$241,846.15	\$241,846.15	\$241,846.15	\$241,846.15	\$241,846.15	\$4,822,518
<b>ADD Initial Inflows</b>													
Investors' Capital	500000	0	0	0	0	0	0	0	0	0	0	0	\$500,000
<b>MINUS Initial Outflows</b>													
Pre-operating expenses	1559669	0	0	0	0	0	0	0	0	0	0	0	\$1,559,669
EQUAL Closing Balance	\$695,626	(\$216,254)	\$4,858	\$4,858	\$4,858	\$4,858	\$4,858	\$4,858	\$4,858	\$4,858	\$4,858	\$4,858	\$523,093

## Balance Sheet Projection

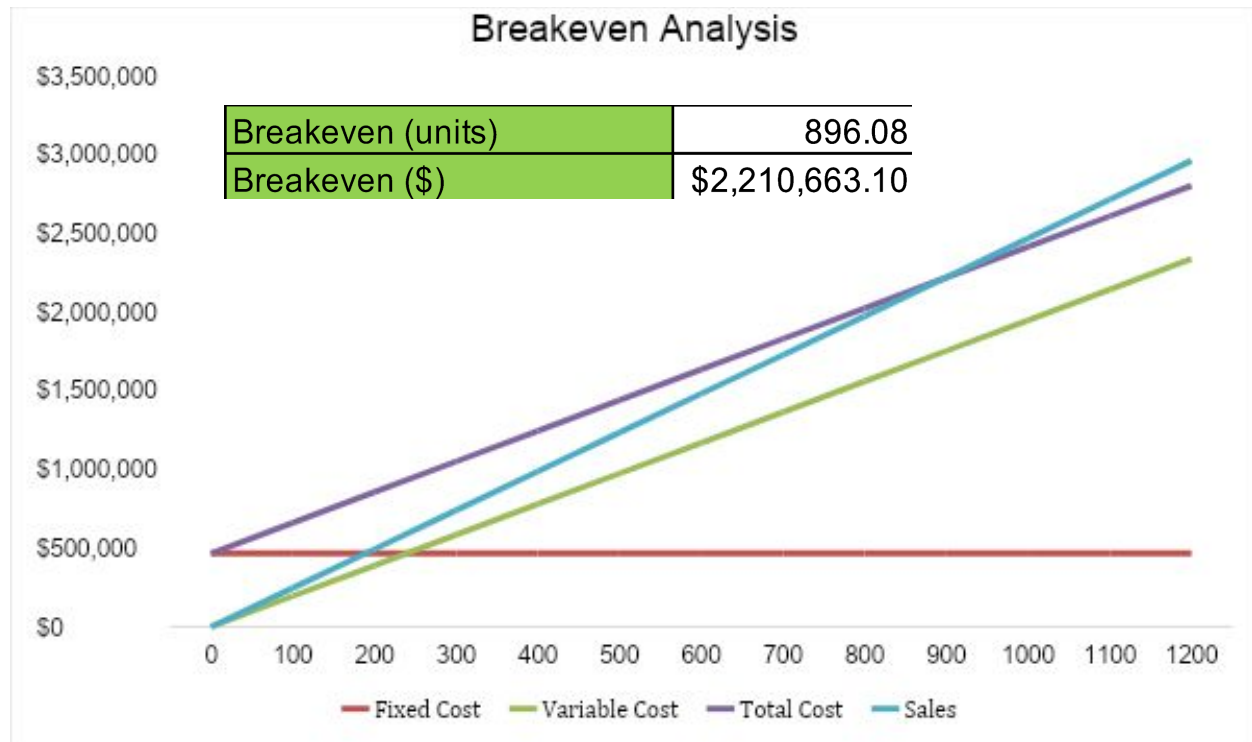
Granted that we follow the financial plan accordingly, we do not expect any problems in meeting our obligations.

### Balance Sheet (Dated 13/4/2020)

<b>FIXED ASSETS</b>	<b>2020</b>
Equipment	\$1,308,728
Less: Accumuated Depreciation	\$87,249
	<u>\$1,221,479</u>
<b>INTANGIBLE ASSETS</b>	
Trademark	\$341
Licensing fee	\$250,000
<b>CURRENT ASSETS</b>	
Cash (Grants & Investments)	\$1,721,549
Accounts Receivable (Sales)	\$2,467,040
	<u>\$4,188,589</u>
<b>Less: LIABILITIES</b>	
Accounts Payable	<u>\$1,700,719</u>
Accruals	\$246,600
Manpower Related Costs	\$186,732
Delivery	\$11,065
Miscellaneous	\$15,600
YXY Royalties (10%)	\$246,704
	<u>\$2,407,420</u>
<b>Net Current Assets</b>	<u>\$1,781,169</u>
<b>Total Net Assets</b>	<u>\$3,002,990</u>

*"The eligible startups in Singapore will be exempted from any tax on the first S\$100,000 of the normal chargeable income. Additionally, the company will be exempted up to 50% of tax on the next \$200,000 normal chargeable income. This exemption is applicable to the startup for its first 3 consecutive assessment years." - IRAS*

## Break-Even Analysis



Lil Green Wear is estimated to breakeven at **896 tons** in the first year. The details of calculations can be found in the appendix.

$$\begin{aligned}\text{Breakeven volume} &= \text{fixed cost} / (\text{price} - \text{variable cost}) \\ &= \$465,997 / (\$2,467.04 - \$1,947) = \mathbf{\underline{896.08 \text{ tons}}}\end{aligned}$$

## Company Valuation

Equity + IP value (Patent, Brand Trademark) + Future Earnings

## Exit Strategies

Regardless of how profitable a start-up company is, we do note that investors of any company need an exit strategy. This includes options such as for the investors to turn their liquid securities into readily tradable securities or cash, to sell their stocks to a willing buyer and the choice to not invest in the next round of financing. We believe that communicating and negotiating with investors will help boost their confidence such as by gaining approval by investors for certain decisions and being transparent about the financial position and financial projections of Lil Green Wear.

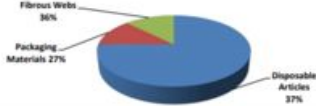
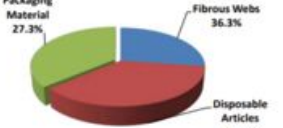
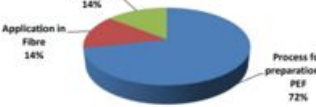
When our company has penetrated the market, we will be applying for an **Initial Public Offering (IPO)**. Fundamentally, an IPO will help in increasing the amount of investment from the public through shares. The capital will enable us to grow our company. It will also allow us to establish our company's presence and visibility in the Singapore apparel market. An IPO is our primary exit strategy as our company holds much potential in Singapore in terms of environmental sustainability.

Our secondary exit strategy is to do a **strategic acquisition**. Avantium has been involved in a strategic acquisition in the year 2018, where BASF exited from the Synvina Joint Venture, and was eventually acquired by Avantium. On 25 January 2019, Avantium acquired 100% ownership of Synvina and paid €17.4million for its 51% equity stake in Synvina to BASF. For our company, since we are taking the approach of adopting a licenced technology from Avantium itself, to be strategically acquired by Avantium can be an option to exit. One benefit is that of liquidity, which can be attractive to investors though it depends on the earn-out period that may last several years. However, considering that a strategic acquisition would result in the loss of operational control of our company, we have to evaluate the status of Lil Green Wear to decide whether to proceed with it.





## Appendix

Companies	Patents		
Toray Plastics	Application in Fibrous Webs <ul style="list-style-type: none"> <li>- US20130023608</li> <li>- EP2668105</li> <li>- US20120238170</li> <li>- US20120237718</li> </ul>		<b>Technological Dissection of Patent Portfolio</b> 
Procter & Gamble	Application in Fibrous Webs <ul style="list-style-type: none"> <li>- US20130023608</li> <li>- EP2668105</li> <li>- US20120238170</li> <li>- US20120237718</li> </ul>	Other Key Patents <ul style="list-style-type: none"> <li>- CN103429278</li> <li>- US8657596</li> <li>- US8871319</li> </ul>	<b>Technological Dissection of Patent Portfolio</b> 
Furanix Technologies (Avantium)	Process for PEF preparations <ul style="list-style-type: none"> <li>- US20140336349</li> <li>- US20110282020</li> <li>- WO2015137804</li> <li>- WO2015142181</li> <li>- WO2015137805</li> </ul> Applications in Fibres <ul style="list-style-type: none"> <li>- WO2014204313</li> </ul> Recycling Process <ul style="list-style-type: none"> <li>- US9073886</li> </ul>	Other Key Patents <ul style="list-style-type: none"> <li>- US8338626</li> <li>- IN265547</li> <li>- CA2644409</li> <li>- EA21670</li> <li>- JP738517</li> </ul>	<b>Technological Dissection of Patent Portfolio</b> 
Universities	<ul style="list-style-type: none"> <li>- CN102453242</li> <li>- CN102276812</li> <li>- CN103275288</li> </ul>		
Other companies	<ul style="list-style-type: none"> <li>- CN102597050</li> <li>- CN102639594</li> <li>- US8846825B</li> <li>- US8715524</li> <li>- FR2985260</li> <li>- CN103113577</li> <li>- FR2995114</li> </ul>		

**Figure 19:** Patent applications of leading companies of PEF production.

## Alternatives

Nevertheless, there are a myriad of eco-friendly textile alternatives out there. Future R&D may be considered if future assessment signals appropriate utilisation in our context. Despite the available options, many of these materials do not fit the requirements for uniforms. They appear to compromise on quality (recycled fiber, peace silk), tap on food sources (PLA, soybean fibre), require high manpower (organic cotton), time-consuming (pineapple fibre), are specialised to specific plant types (hemp, lyocell) or carry potential health concerns (organic wool, rayon).

Eco-friendly textiles	Characteristics
Organic Cotton	Environmentally friendly but requires a lot of manual labour thus increasing prices greatly.
Recycled Fibre	Fabric recycling (Eg, natural fibres) done by mechanical breakage of fabric resulting in low-quality recycled fabric.
Polylactic Acid (PLA)*	Thermoplastic polyester, derived from 100% renewable sources like corn. However, corn is a source of food. Materials produce methane in landfills which can harm the Earth and humans.
Soybean Fibre	Fibre as an alternative to cashmere. Soybean as a food source.
Pineapple Fibre	Fibre used as an alternative to leather. Age-old tradition in the Philippines to make Pinatex. Complexity and time-consuming production processes increased prices greatly.
Hemp	Hemp originates from the cannabis sativa plant but they are dull and rough. Hemp also uses 1/40 water when compared to cotton and has a high yield of 20-30% plant made of fibre.
Lyocell	Tencel; made from wood pulp of eucalyptus trees. Fabrics made from this material are easily creased.
Peace Silk	Vegetarian silk; silkworms are allowed to grow until they leave their chrysalis. The damaged chrysalis still allows for silk extraction but of lower quality.
Organic Wool	Sheeps graze on pesticide free grass, but medication is given to prevent parasites on these sheep, resulting in a small market.
Rayon	A biodegradable fibre made from cellulose of softwood trees or bamboo. Treatment chemicals seem to cause Parkinson's disease and other health problems. Big manufacturers may replace original trees with bamboos for large scale productions, which may not be as friendly to the environment.

Adapted from <https://zerrin.com/blogs/read/10-sustainable-eco-friendly-fibres-textiles-2019>

Zooming into the bioplastics segment, we observe three main bioplastics out in the market. These materials are synthesized from different primary raw materials and diff in the degree of biodegradability. Additionally, the production process of these plastic building blocks differ as well.

Bio-based Plastics	Characteristics
Polylactic Acid (PLA)	Building block: Lactic Acid Obtained from fermentation of plant-derived sugars Application: Bottles, Containers, Packaging, Foils
Polyhydroxy Alkanoate (PHA)	Building block: Similar chemical polymers; Mainly PHB (poly-3-hydroxybutyrate) Obtained from biological processes by microorganisms Application: Medical purposes, Food Packaging
Polyethylene Furanoate (PEF)	Building block: Ethylene Glycol, Furane Dicarbonic Acid Obtained from fructose sugar in many plant feedstocks Application: Soft Drink Bottles, Food Packaging

Adapted from <https://www.mdpi.com/2071-1050/10/5/1487>

Here are some issues with the use of PLA in recycling facilities. In the PET recycling facilities, all plastics are taken for recycling. PLA and PET have similar densities thus they cannot be separated easily. As PLA has a lower melting point than PET, molten PLA becomes degraded overtime and causes yellowing of the resulting recycled product. Essentially, PLA and PET are not compatible in recycling facilities. Similar issues may be encountered with PHA/PHB. Lastly, PEF appears to be the best choice currently due to similar melting point as PET, posing as a compatible recycling material with the current PET usage. There seems to be no negative impacts of PEF entering PET streams as reported by the European PET Bottle Platform (EPBP). However, more studies have to be conducted on large-scale entry to reassess impact on rPET quality.

**Table 1.** Densities and melting points of a number of plastics.

Plastic Type	$\rho$ (kg/m <sup>3</sup> )	T <sub>m</sub> (°C)
Polyethylene terephthalate (PET)	1350–1390	255
High-density polyethylene (HDPE)	930–970	125
Polyvinyl chloride (PVC)	1100–1450	210
Polylactic acid (PLA)	1200–1450	155–165
Poly-3-hydroxybutyrate (PHB)	1300	180
Polyethylene furanoate (PEF)	1400–1550	225

The ranges are based on the results of a general search on the internet, completed by data retrieved in the references consulted for this paper.

Adapted from <https://www.mdpi.com/2071-1050/10/5/1487>

## Operations

Equipment	Purpose	Price (SGD)	
10L bioreactor	Conversion of sugar cane/raw materials into glucose	\$ 6,407.10	
Chemicals	Purpose	Price (SGD)	
Glucose isomerase	Conversion of glucose into fructose	\$ 56.95	per kg
Sulfuric acid	Sugar Dehydration Process	\$ 270.50	per ton
Nitric acid	Oxidation & Purification Process	\$ 298.86	per ton
Ethylene glycol	Polymerisation Process	\$ 2,135.70	per ton

Figure 20: Equipment required for producing fructose from raw materials

Process	Item
Fore Spinning Line	Raw Material
	Vacuum Dryer
	Screw Extruder
	Filter
	Spinning Beam
	Quenching unit
	Interfloor Duct
	Draw-off wall
	Capstan Roller
	Sunflower Gearing Unit
	Fiber can Transverse System
After Spinning Line	Can Creel
	Inlet Thread Guide
	Tow Guide Stand
	Dipping bath
	1st Draw Stand
	Draw bath
	2nd Draw Stand
	Draw Steam Chest
	3rd Draw Stand
	Tow Stacker
	Crimper
	Tow conveyor
	Relaxer
	Tow Tension Stand
	Cutter
	Chain Plate Conveyor
	Baling Press

Figure 21: List of Pre- and Post- Thread Spinning Equipment

Equipment	Usage	Price (SGD)
Microscope/various chemicals	Test and identify fiber content	\$ 141.57
Pressley Bundle Tester	Yarn count	\$ 2,717.00
Pick Glass	Count construction	\$ 7.14
Elmendorf Tear Tester	Tear strength	\$ 1,144.00
Tensile Tester	Tensile strength testing	\$ 5,005.00
GSM cutter	GSM testing of fabric	\$ 25.74
Weighing balance (up to 0.005)	Weighing of material	\$ 1,001.00
Crock meter	Rubbing fastness (Dry and wet)	\$ 572.00
Washing machine	Shrinkage & colour bleeding testing	\$ 207.35
Tumble Dryer		\$ 245.96
Laundro meter	Colour fastness to washing	
pH meter	pH testing	\$ 14.30
Hot air oven	Ageing test of physical properties	\$ 257.40
Colour matching machine	Colour matching	\$ 143.00
ICI piling tester	Pilling test	\$ 429.00

**Figure 22:** List of Equipment for Fiber Quality Checks

## Break-Even Analysis

**Breakeven volume = fixed cost/(price - variable cost)**

	1000 tons per year	1 ton per year
<b>Slope of total revenue per ton</b>		\$1,405.85
<b>Sale Price</b>	<b>\$2,467,040</b>	<b>\$2,467.04</b>

<b>Fixed Cost</b>	(Month)	(Year)
Office Rent	\$4,050	\$48,600
Plant Rent	\$15,000	\$180,000
Utilities Fee	\$1,500	\$18,000
<b>Manpower</b>	\$13,300	\$159,600
CPF	\$2,261	\$27,132
Insurance	\$500	\$6,000
Marketing Fees	\$1,000	\$12,000
Delivery Services	\$922	\$11,065
Postage, Printing & Stationery	\$100	\$1,200
Telephone Subscription	\$200	\$2,400
<b>Total</b>		<b>\$465,997</b>

<b>Variable Cost</b>	1000 tons per year	1 ton per year
Raw Materials	\$1,700,718	\$1,701
YXY Tech Royalties (10%)	\$246,704	\$247
	<b>\$1,947,422</b>	<b>\$1,947</b>

<b>Total cost is variable + fixed cost</b>	<b>\$467,945</b>
--	------------------

This cost list was used to generate the breakeven amount and the breakeven graph.



Units	Fixed Cost	Variable Cost	Total Cost	Sales
0	\$465,997	\$0	\$465,997	\$0.00
100	\$465,997	\$194,700	\$660,697	\$246,704.00
200	\$465,997	\$389,400	\$855,397	\$493,408.00
300	\$465,997	\$584,100	\$1,050,097	\$740,112.00
400	\$465,997	\$778,800	\$1,244,797	\$986,816.00
500	\$465,997	\$973,500	\$1,439,497	\$1,233,520.00
600	\$465,997	\$1,168,200	\$1,634,197	\$1,480,224.00
700	\$465,997	\$1,362,900	\$1,828,897	\$1,726,928.00
800	\$465,997	\$1,557,600	\$2,023,597	\$1,973,632.00
900	\$465,997	\$1,752,300	\$2,218,297	\$2,220,336.00
1000	\$465,997	\$1,947,000	\$2,412,997	\$2,467,040.00
1100	\$465,997	\$2,141,700	\$2,607,697	\$2,713,744.00
1200	\$465,997	\$2,336,400	\$2,802,397	\$2,960,448.00

Breakeven (units)	948.25
Breakeven (\$)	\$2,339,375.76

This table was used to plot the breakeven graph.

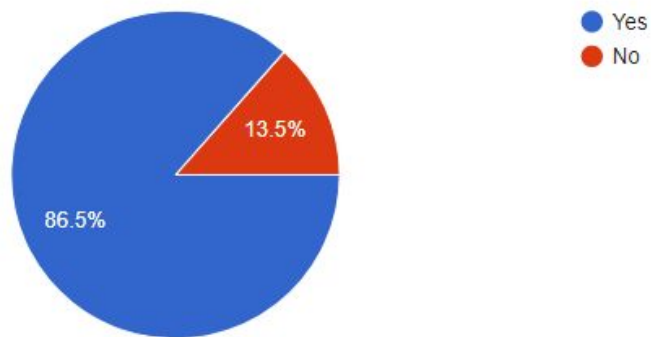
## Survey

Are you currently a parent?	
Yes	No
What is your age?	
Fill in	
Do you have children in primary school now? Yes/No	How many sets of school uniforms did you have during secondary school? 1-5
Do you have children in secondary school now? Yes/No	How many sets of school uniforms did you have during Junior College/ITE? NIL, 1-5
Do you have children in tertiary institutions now? *Tertiary refers to Junior Colleges/ITE Yes/No	
Please select the number of set of uniforms you purchase for each child per year. 1-5	Do you think school uniforms are expensive? Yes/No
How much do you spend on them each year? <\$30, \$30-\$39, \$40-\$49, \$50-\$59, \$60-\$79, \$80-\$89, \$90-100	How much do you think a set of uniform costs? <\$30, \$30-\$39, \$40-\$49, \$50-\$59, \$60-\$79, \$80-\$89, \$90-100
How often does your child wear formal uniform (not PE attire)? 1x a week 2x a week 3x a week 4x a week 5x a week	How often do you wear formal uniform (not PE attire)? 1x a week 2x a week 3x a week 4x a week 5x a week
How often does your child wear PE attire? 1x a week 2x a week 3x a week 4x a week 5x a week	How often do you wear PE attire? 1x a week 2x a week 3x a week 4x a week 5x a week
What do you hope to have in the quality of school uniforms? <i>*Select those that are applicable</i> Able to withstand many washes Easy to dry Comfortable to wear No ironing required Environmentally friendly material Non-odour retaining Others: _____	

<p>After graduating from school, what do you do with your worn school uniforms?</p> <p>Throw away Send to Red Cross Keep as memento Others: _____</p>
<p>Are you interested in saving the environment, even in the smallest way?</p> <p>Yes/No</p>
<p>Would you be willing to send the worn clothes back to school for recycling?</p> <p>Yes/No</p>
<p>Would you be willing to send the worn clothes back to school for recycling <u>if there is a discount for your next purchase?</u></p> <p>Yes/No</p>
<p><b>Please provide a reason for your previous answer. *Required</b></p>
<p>Would you be willing to pay the <u>same or a higher price</u> for school uniforms that are environment-friendly, made from biological materials (without compromising on the quality)?</p> <p><i>*Bear in mind the recycling program after use</i></p> <p>Yes/No</p>
<p><b>Please provide a reason for your previous answer. *Required</b></p>
<p>If Yes, how much more would you accept?</p> <p><i>*For example, \$15 for the TOP,</i></p> <p>5% increase = +75cents 10% increase = +\$1.50 15% increase = +\$2.25 20% increase = +\$3.00</p> <p>0%, 5%, 10%, 15%, 20%</p>
<p>Would you be willing to purchase apparels that are made from biomaterials, if they are offered by school uniforms vendors?</p> <p>Yes/No</p>
<p><b>Please provide a reason for your previous answer.</b></p>
<p>Would you be willing to purchase apparels that are made from biomaterials, if they are offered by big brands (Eg, Nike, Adidas)?</p> <p>Yes/No</p>
<p><b>Please provide a reason for your previous answer.</b></p>

Would you be willing to purchase apparels that are made from biomaterials, if they are offered by school uniforms vendors?

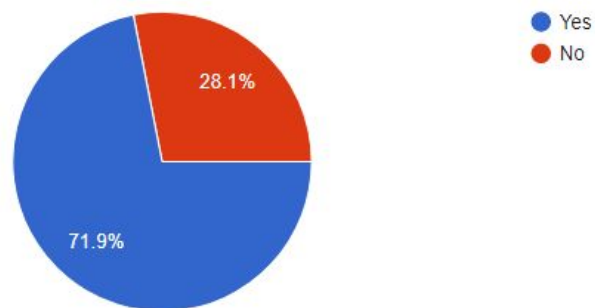
89 responses



Would you be willing to pay the same or a higher price for school uniforms that are environment-friendly, made from biological materials (without compromising on the quality)?

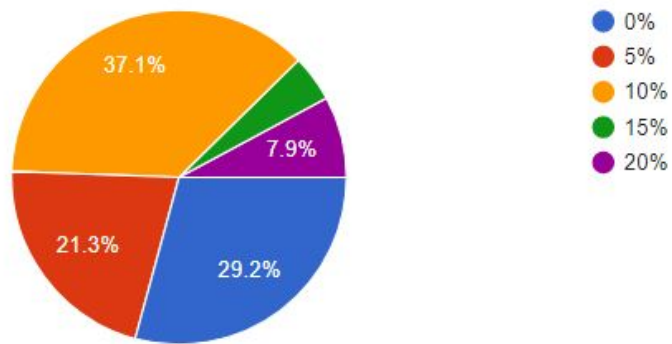
\*Bear in mind the recycling program after use

89 responses



If Yes, how much more would you accept? \*For example, \$15 for the TOP, 5% increase = +75cents, 10% increase = +\$1.50, 15% increase = +\$2.25, 20% increase = +\$3.00

89 responses



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