

Business plan

A methodology for introducing Ballys to Avans students and employees with a focus on market, marketing, finances, environmental and technical aspects of Ballys.

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EXECUTIVE SUMMARY

This report provides a business plan for Ballsy to use for the introduction of the biobased Christmas baubles within Avans channels. This was done by analyzing the market, marketing, financial, environmental and technical aspects with a focus on Avans students & employees and the current production process. Research boundaries included a focus on the Dutch market (Avans students & employees), specific target segmentations (generations, X, Y & Z), a limited environmental analysis (focusing on resources, omitting production process) and a technical assessment based on the production process at initiation of the project.

Methods of analysis include a macro, micro and meso assessment of the market, the execution of qualitative and quantitative research regarding marketing, an MCA of the resourcing and end-of-life of the product and competitors, and an estimation of the production capacity and limiting factors. The macro, miso and meso assessment included different models and analysis such as DESTEP, value proposition, BMC, competitor analysis, and the 7s-model. The marketing research produced persona's and a customer journey highlighting the most important factors in purchasing. Competitor products up for analysis were: glass, polystyrene and wooden ornaments. The MCA regarding resourcing focused on proximity, process efficiency, and waste streams. The MCA of end-of-life focused on leaving the products in four different waste streams (residual, green, environment, recyclability).

The development in the customer journeys highlighted the importance of the awareness phase of the customer as many are still unfamiliar with the product. A concentration strategy focusing on each target groups may aid in meeting the needs of specific target segmentations and provide a differential advantage over competitors. Qualitative research provided important insights in the preferred presentation of the baubles. The financial assessment included balance sheets, liquidity budget and a risk assessment which showed the need for a financing requirement shortly after the three-year mark. Due to quick turnover, decreasing liquidity and increased risk of investment requirement over time, the assessed scenario produced a viable short-term business case, but an unviable long-term case. MCA results showed that the solanyl bauble and wooden ornaments were very comparable in terms of sustainability. Products must be careful in their classification of environmental labels such as biobased, sustainable, compostable etc. to prevent greenwashing. All the baubles comply with legislative requirements for biobased products. However, it is one bridge too far to claim that the product is more sustainable or environmentally friendly compared to competitors. The technical assessment showed a minimal required production capacity of 3.3 minutes per set at a scaled-up scenario of 3750 sets.

The recommendations regarding the market position of Ballsy include an annual review of the macro environment, an active marketing strategy focusing on the specific target segmentations using platforms of Avans, the website, SEO, e-mail and social media advertising. A casual and informal tone of voice and clear branding style is proposed to create credibility and trust. Following of a customer intimacy strategy together with tailoring and shaping the product based on customer can aid in increasing brand association and the feeling of loyalty. It is important to ensure visibility of brand story and image through all communication channels. Cause related marketing is very likely to enhance the reputation of the product. It is important to revise the internalization of marketing costs, determine whether product growth is desirable and to re-evaluate the cost price, markup percentage and continue the liquidity budget. An LCA of the different baubles and competitors can provide meaningful insights in their respective environmental impacts. The steps of the production process most likely to pose a limiting factor are the molding and pre-treatment phase, increasing production time instead of capacity might be more financially feasible.

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1 THE ENTERPRISE

The Centre of Expertise Biobased Economy (CoE BBE for its acronym in English) is central in the transition towards a biobased economy. It executes applied research, aids companies with their biobased ambitions and ensures all levels of education include biobased aspects (1).

The Centre of Biobased Economy is a non-profit institution and was founded in 2012. With fifty ongoing research projects, more than two hundred affiliated companies and institutions, their own application center and a central place in many different biobased networks, they are ready to innovate, experiment and invest together (2).

1.1 THE IDEA

The Centre of Expertise Biobased Economy came up with an idea to make Christmas more biobased and, together with several companies, developed fully biobased Christmas baubles that is made from pine needles that come from discarded Christmas trees (3).

The concept of the biobased Christmas baubles would not only increase awareness regarding biobased inventions and the concept of a biobased economy but has the possibility to actively reduce and reuse residual Christmas-related streams. Due to this being a fairly new concept, there is not a lot of information available regarding suitable marketing strategies, environmental aspects, technical challenges or financial opportunities. This research project is aiming to aid in this by setting up a business plan addressing all these aspects (4).

1.1.1 The problem

The Centre of Expertise Biobased Economy would like to introduce their innovation, the biobased Christmas baubles, to the market. It is of huge importance that The Centre of Expertise Biobased Economy obtains sufficient information on how to target their potential customers and introduce the biobased Christmas baubles into the market.

To do this, it is important to retrieve sufficient information on the environmental and technical encounters of the Christmas baubles, their financial prospects and marketing. Insights on these matters will be gained in order to finally introduce the biobased Christmas baubles, raise awareness and attract customers.

1.1.2 The solution

The solution and goal are to develop a business plan in order to obtain a clear view on how to best introduce the Christmas baubles into the market targeting the customer segments of students and employees of universities in the Netherlands. It is important to gain insights into the current information available from The Centre of Expertise Biobased Economy and to obtain new information on how to best introduce the product in order to give clear advice about the market positioning of the biobased Christmas baubles.

1.2 CURRENT SITUATION

The development of the biobased Christmas baubles, called 'Ballsy' went quicker than originally expected. The initial launch date of Christmas 2021 has been brought forward by attempting to fulfil production already in 2020. Part of the Christmas packages within Avans university will contain the products, as well as project partners and, potentially, students.

As the launch is executed prior to the original date, the draft business plan will also be sent to the client in an effort to contribute to the original launch.

2 THE MARKET

Christmas baubles have existed for almost 500 years and come in many colors, shapes and materials. But what makes the biobased Christmas baubles stand out of all the other Christmas baubles? Regular baubles are usually made of fossil-based plastics. Lots of these Christmas products are thrown away every year. With the transition to a circular economy, the biobased baubles, called 'Ballsy' are a step in the right direction to create biobased awareness and contribute to a more sustainable Christmas season. This chapter contains information regarding the market for biobased Christmas baubles and is divided into macro, meso and micro analysis.

2.1 MACRO ENVIRONMENT

This section focuses on the macro environment of the entity. The macro environment refers to macroeconomic conditions such as production, spending, price levels, etc.

2.1.1 DESTEP-analysis

The DESTEP-analysis is used to analyze the macro surrounding of the organization. When this insight is clear, it is important to align the strategy based on the findings. This will give a business opportunity for the biobased Christmas baubles. In each factor different aspects will be discussed. The DESTEP-analysis in this chapter only states the most relevant parts to review for CoE BBE at the moment. The complete analysis can be found in Appendix I.

2.1.1.1 *Demographic*

Especially in time of rapid world population growth and overall demographic changes, evaluating people is critical to companies. Changing demographics cause changing markets, which creates a need for adjusted marketing strategies (5). One of these critical demographic changes is the population composition. The Netherlands counts about 17,3 million residents which will continuously grow in the upcoming years, but the pace of growth will slow down compared to the previous years.

This will lead to an increased number of elderlies in the future and thus hazing and aging of the society. Because of this, the customer demand changes, and specific target groups must be approached to increase market impact (6).

2.1.1.2 *Economic*

Economic factors affect consumer purchasing power and spending patterns (5). According to the CBS The Netherlands, the gross domestic product fell by 8.5 percent in the second quarter of 2020 compared to the previous quarter. This decrease can be attributed to the sharp fall in household consumptions, as there is a decrease of 11.4 percent in their spending behavior.

Because of the COVID-19 crisis, there has been an unprecedented decline in most industries as they were required to close for a period of time (7). The growth of unemployment is damaging the economy, but assuming that the unemployment rate will be back on the structural level before the crisis within five years, means that buying power will increase relatively over that time period. The main reason for this is that COVID-19 is not triggered because of an underlying cause of related to the economy (8).

2.1.1.3 *Ecological*

Natural forces in the macro environment are important as environmental concerns have been growing strongly in recent years, which makes the ecological force a crucial factor to consider and become aware of as a company (5). The climate is increasingly changing in The Netherlands and research shows that average temperatures will rise in the upcoming decades, which will have major consequences for The Netherlands.

In the upcoming years, environmental measures will become an important point of attention. The predicted climate change will not only have effects on the environment but on the safety of the country as it effects the water level (9). As the ecological forces will have a negative influence on the country, it is important to align the business strategy with environmental concerns and collaborate to contribute positively towards the environment.

2.1.1.4 Political

The political environment will influence and restrict businesses and individuals in the society and thus affect decisions in the production or marketing of the product (5). Sustainability is not only included in environmental, but also political components. The Dutch government has many ambitions in the field of sustainability.

Rules are drawn up for the reduction of energy, the reduction of natural gas and there will be a switch to alternative energy sources (10). The government will work together with different parties in order to stimulate sustainability within residents and corporations. The business community is an important partner for the national government when working toward a CO₂ neutral energy supply and encourages companies to invest in sustainable energy and a sustainable environment by providing subsidies to businesses that invest in a better and sustainable future (11).

2.2 MESO ENVIRONMENT

This section focuses on the meso environment of the entity. The meso environment consists of factors that can be indirectly influenced by the entity, such as potential of new entrants within the branch.

2.2.1 Value proposition canvas

The Value Proposition Canvas is a customer analysis tool. This tool serves to systematically map out a part of the meso environment, what the customers wants, so that the product offering can be created, which perfectly matches their needs and values. Moreover, the Value Proposition Canvas is often used and combined with the Business Model Canvas (12), which is described in 2.2.2. Because there are multiple target groups (generation X, millennials and generation Z) the value proposition canvas has been filled in for each target segment. The target segments are elaborated on in chapter 3.1.

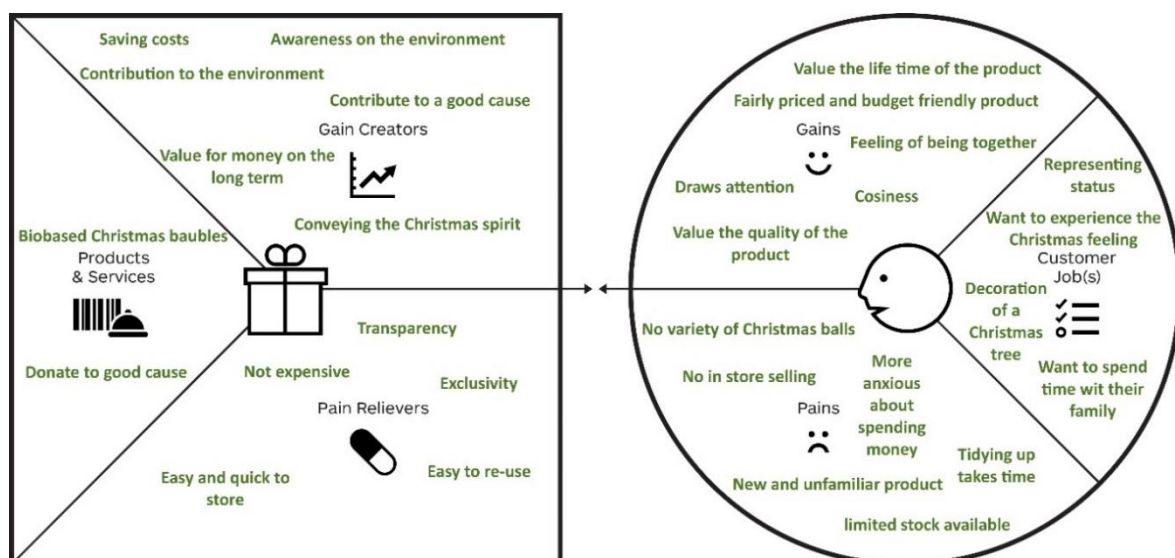


Figure 1 Value proposition generation X

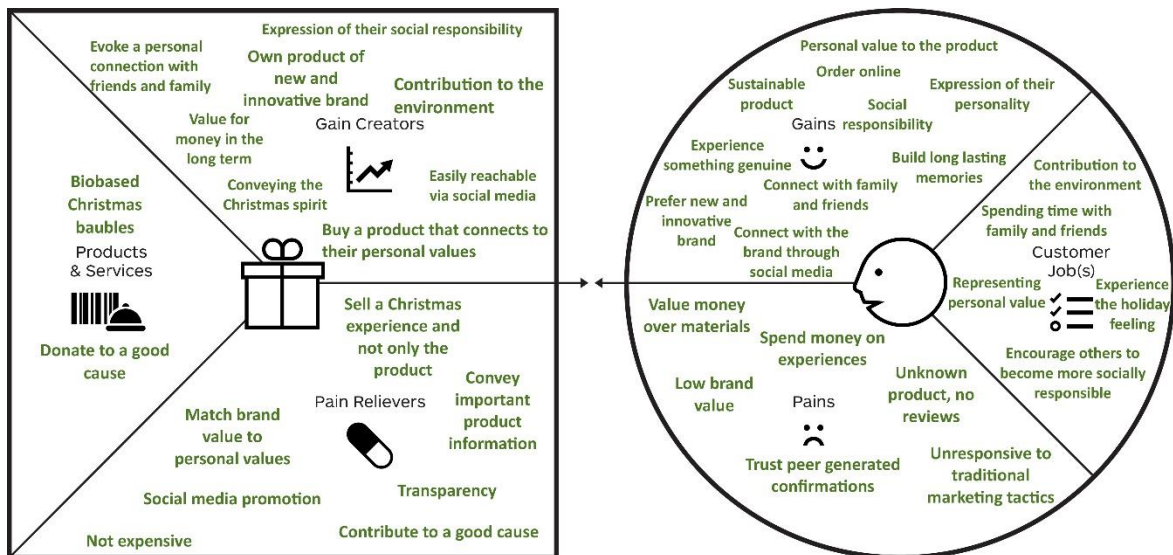


Figure 2 Value proposition millennials

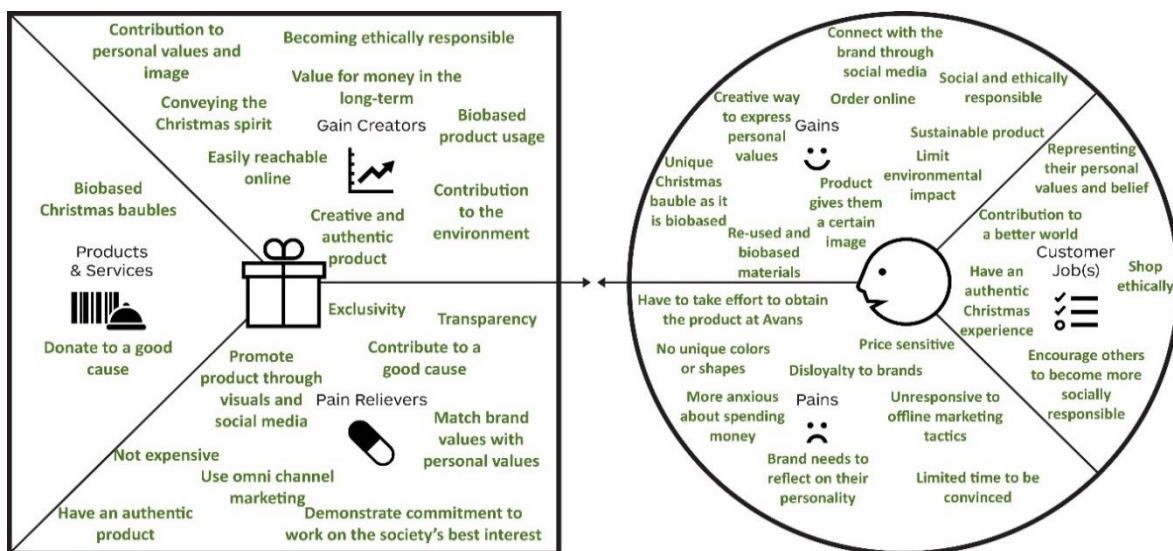


Figure 3 Value proposition generation Z

2.2.2 Business model canvas

The business model canvas (BMC) categorizes the processes and internal activities of a business into 9 separate categories. Each building block represents the creation of the product (13). This business model canvas is a strategic management tool to quickly and easily define and communicate a business idea or concept through the fundamental elements of a business or product.

There are two sides in the business model canvas and both the external and the internal factors meet around the value proposition, which is the exchange of value between the business and the customer (14). The business model canvas of CoE BBE is displayed in Figure 4. A detailed explanation on the BMC and how it was applied to this project can be found in Appendix II.

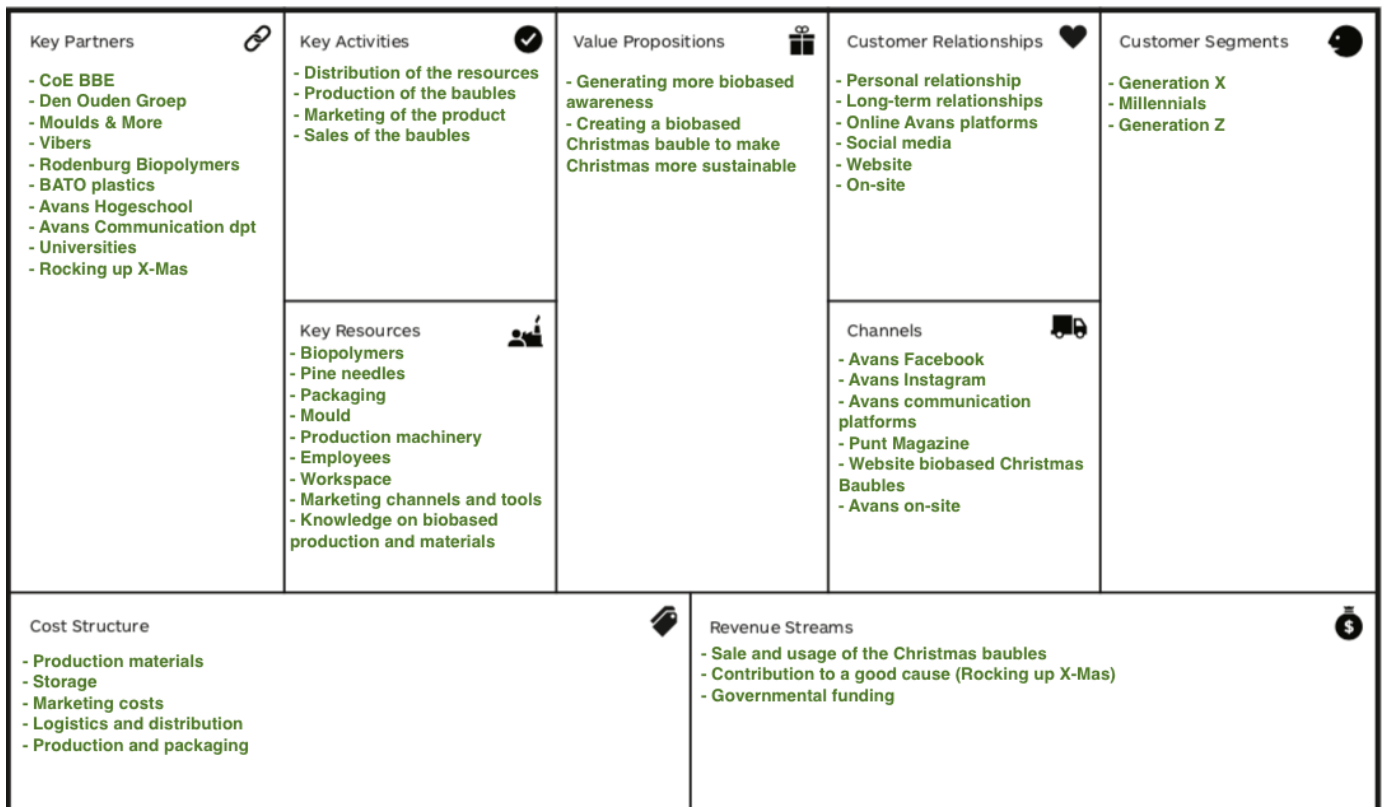


Figure 4 Business model canvas

2.2.3 Stakeholder analysis

A stakeholder analysis was conducted at the start of the project. The stakeholder analysis is used to find out which internal and external stakeholders are involved during the project. All the stakeholders were identified and categorized into primary, secondary, internal, external and interface stakeholders.

With this information, a power grid and relationship map were created, and interesting relationships have been identified. During the project, multiple of these relationships have been utilized and should be maintained after finalizing this project. One example of a utilized relationship is the relationship between the project group and BAC. The project group and BAC have been in touch often to discuss technical aspects of the project and to come up with the financial calculation which ended up in a cost price of a set of Christmas Baubles. There were also multiple relationships that were very useful but not utilized very often. For example, the project group has only been in touch with the suppliers when really necessary, to gather the required information to successfully finalize the project. However, this only speaks for the experience from the group, not from CoE BBE. More insights on the stakeholder relationships can be found in Appendix III.

2.2.4 Competitor analysis

Based on the competitor analysis results in Appendix V and an Internal analysis in 2.3, a multi criteria assessment was conducted regarding the customer values such as the location of the store, assortment, price, online communication channels, and sustainability. The weighing of each category is equal, and the results can be found in Table 1.

The location of the store was assessed based on the proximity of the store to the center and whether it is easily reachable. The assortment was based on the range of products that the company offers. Pricing was determined by comparing the price of competitors to that of CoE BBE. Communication channels were assessed regarding how easily the companies can be reached online, via the website and different social media platforms and whether this website and social media channels are active

and attractive. Moreover, an assessment regarding the environmental factors was also executed to determine how the baubles compare sustainability-wise. This assessment can be found in chapter 5.

Unfortunately, not all information regarding researched criteria was available, such as the price of Marijn Kroese Bloem & Plant, Tuincentrum GroenRijk Schal and Søstrene Grene. Besides this, the website of The Centre of Expertise Biobased Economy could not be assessed while conducting this MCA since it was still under development. The criteria that could not be assessed are marked as 'NK' (not known).

The result of the MCA references to the marketing position of the different companies, a high number refers to a better position on the market based on the customer values. It shows a summary of the comparison between the competitors and the Centre of Expertise Biobased Economy.

Table 1 Multi criteria analysis Competitors

Company	Location	Assortment	Price	Website	Social media	Sustainability	Total
CoE BBE	+1	-2	+2	NK	+2	+2	+5
Intratuin	0	+2	+2	+2	+2	-2	+6
Marijn Kroese Bloem & Plant	+2	+2	NK	+1	-2	-2	+1
Tuincentrum GroenRijk Schalk	-2	+2	NK	+1	+1	-2	0
Søstrene Grene	+2	+1	NK	+2	+2	0	+7
Blokker	+1	+2	+1	+1	+1	-2	+4

2.2.5 Porter's five forces

The porter's five forces model is a model that identifies and analyses five competitive forces that shape an industry and helps determine the industry's weaknesses and strengths. Porter's five forces are frequently used to measure competition intensity, attractiveness and the profitability of an industry or market (15).

2.2.5.1 Competition in the Industry

The first of the Porter's five forces refers to the number of competitors and their ability to weaken a company, specific results can be found in Appendix V and showed the biobased Christmas baubles have no direct competition since the competitors do not sell any biobased products. Even though there are competitors mentioning that sell wooden baubles and market these products as biobased it cannot be guaranteed that these Christmas baubles are only produced with biobased materials and therefore are also considered as indirect. CoE BBE has a low direct competitive rivalry as they are the only one introducing and selling the biobased Christmas baubles. However, the indirect competition is highly competitive as there is a large number of competitors that sell normal Christmas baubles. Potential customers are likely to prefer normal baubles as they have a very large range of equivalent products. This can influence the power of CoE BBE and the sales of Ballsy. The larger the number of competitors, along with the number of equivalent products that they offer, the smaller the power of CoE BBE (15).

2.2.5.2 Potential of new entrants into an industry

The company's power is also affected by the force of new entrants into the market. Ballsy only has indirect competitors at the moment and have a very specific monopoly on the market for biobased Christmas baubles. The potential of new entrants might be enormous but depends on the investments in the production process and resources of large competitors. To produce and market biobased Christmas baubles, competitors must invest in new materials, but also in understanding the production process and the used techniques for biobased products, which takes time and costs money. The biobased market they are in has many barriers to entry, which is ideal, as potential entrants need to invest a lot in order to potentially weaken the position (15). Although it takes some time and effort for

new entrants to produce the biobased baubles a significant increase is expected as biobased products are increasingly more demanded and are becoming important for companies considering new legislation.

2.2.5.3 *Power of suppliers*

This force addresses how easily suppliers can drive up the costs of the inputs for the production. This is dependent on the total number of suppliers available for the inputs of the product, how unique these inputs are and how easily a company might switch to another supplier (15). To develop the biobased Christmas baubles several partners are needed, such as the mold manufacturer, the pine needle supplier, the biopolymers and the packaging supplier. In this business case, there are not many suppliers available and have unique inputs since residual flows considering of biomass are increasingly desirable. Because of this, CoE BBE might be dependent on the suppliers and their input, which can increase the bargaining power of suppliers.

2.2.5.4 *Power of customers*

The power that customers might have on the product depends on how many customers the company has and how significant each customer is within the market (15). The power of the target segmentations is enormous, as they decide whether they would like to make use of the product and buy Ballsy. The number of customers will more likely depend on whether they would like to contribute to a more biobased Christmas and a biobased economy and whether they like the appearance of the biobased Christmas baubles. This might lead to a problem as CoE BBE cannot guarantee that the Ballsy will be sold in the preferred color nor the preferred shape or size. In this case, CoE BBE might have a smaller, but very powerful client base.

2.2.5.5 *Threat of substitutes*

These are substitute products that might be used in replacement of the company's products and thus pose a threat to the sales of the current product (15). The most critical substitutes are normal Christmas baubles that can be bought in different shapes, materials and colors at indirect competitors. Whenever a customer prefers to have Christmas baubles in another shape or color which The Centre of Biobased Expertise does not offer, another product possibility might be chosen instead of the biobased Christmas baubles. This, however, might not be a suitable option as quantitative research of the target segmentations, found in Appendix VI, shows that many potential customers put high value on sustainability as they want to contribute positively to the environment. Consequently, biobased Christmas baubles might satisfy this market.

Overall, it can be deduced that the market for biobased Christmas baubles is attractive, as biobased products are becoming more popular in upcoming years. There are no direct competitors at the moment, which makes entering the market more appealing. Since the number of indirect competitors and their substitute products are quite high and diverse, as they sell glass, plastic or wooden Christmas baubles that come in many shapes, sizes and colors, it is possible that the force of The Centre of Expertise Biobased Economy will be reduced on the market. However, qualitative research shows that the interest in circular and sustainable products of potential customers is expected to increase and that the client base which is expected to be small during the introduction and the sales of Ballsy will most likely grow significantly in upcoming years.

2.3 MICRO-ENVIRONMENT

This section focuses on the micro-environment of the entity. The micro-environment focuses on the operating (internal) environment of the entity. First, the mission, vision and core values are described and afterwards the organization is further examined by the 7S model.

2.3.1 Mission

The mission of CoE BBE is to help companies with their biobased ambitions (16). This report focuses on the biobased ambition of the implementation of biobased Christmas baubles and the mission to introduce the biobased Christmas baubles into the market in order to create biobased awareness.

2.3.2 Vision

It is the vision of the Centre of Expertise Biobased Economy to create biobased awareness in the near future and make communities, cities and many others aware regarding the importance of a sustainable Christmas, all while experiencing the most beautiful time of the year.

2.3.3 Core values

Important corporate values of the CoE BBE are sustainable entrepreneurship, biodiversity, responsibility, innovation, efficiency and a transition to a biobased economy.

2.3.4 Product

The Centre of Expertise Biobased Economy focuses on projects that specialize in the biobased economy. The Centre of Expertise Biobased Economy is working together with their partners to figure out whether they can make fully biobased Christmas baubles that contains needles from last year's Christmas trees to create biobased awareness (17). Thus, the product that The Centre of Expertise Biobased Economy is offering are biobased Christmas baubles made from pine needles and biopolymers.

2.3.5 Sales points

At the moment, the distribution channel for the biobased Christmas baubles is at Avans university. Students and employees can order the baubles online, pick them up and pay for them at several Avans locations. Other distribution channels will become available at other universities when upscaling becomes desirable/feasible.

2.3.6 Price

The price is a very important aspect considering required sales to cover the costs. As the Centre of Expertise Biobased Economy just started with the production of the biobased Christmas baubles the sales price has been determined at €7.12, a detailed calculation of the price can be reviewed in 4.1.

2.3.7 Place

CoE BBE is situated in Breda, North-Brabant at the Educational institution Avans university of applied sciences. The institution is located approximately 5 minutes by car from the city center in the neighborhood Ijpelaar (17).

2.3.8 Promotion

The website of the company is clear and modern. It includes a clear explanation elaborating what The Centre of Expertise Biobased Economy is about, as well as all ongoing projects (18). Besides the website, CoE BBE can be found on LinkedIn, Facebook, twitter and YouTube, with general information and an overview on they are about and posts about ongoing projects. Next to their own communication channels, CoE BBE can also utilize the different Avans media channels. Recently, CoE BBE has published a website for the introduction of Ballsy. Besides the website, there are currently no specific promotion channels. Because CoE BBE has their own communication channels and can utilize Avans channels, the marketing costs can remain low while promoting their products. Making use of these owned communication channels is a feasible strategy. The promotion channels for the biobased Christmas baubles will be analyzed and recommended within this business plan in Chapter 3 The Marketing plan to introduce the product in an appealing manner.

2.3.9 7S-model by McKinsey

The 7S-model by McKinsey is useful to examine how different parts of an organization work together. The model consists of hard and soft elements. Hard elements can be influenced by management directly. These elements are strategy, structure and systems. The four remaining soft elements are harder to influence and are about the culture of the business. These elements are shared values, skills, style and staff. In this part, the elements will be shortly explained, including recommendations.

2.3.9.1 *Strategy*

CoE BBE believes in a biobased economy, biobased products and other biobased specialties and, therefore, new projects are carried out frequently. In this ongoing project of the Christmas baubles, CoE BBE is joining forces with partners such as Den Ouden, Molds, Vibers and Rodenburg biopolymers to make Christmas more sustainable. This product was developed using pine needles from old and discarded Christmas trees (17). The main strategy is to increase biobased awareness is by introducing Ballsy onto the market.

2.3.9.2 *Structure*

The Centre of Expertise Biobased Economy is an educational institution which operates in the renewables and environment industry. The company has a size of 11-50 employees with specialties in biobased products, biobased economy, biobased building, biopolymers, biobased energy and marine biobased specialties (2). CoE BBE has a flat organizational structure. Within a flat organizational structure, there are very few or even no levels of management between the management and staff.

2.3.9.3 *Systems*

Systems are the daily activities and procedures the staff must execute to do their job. A good set of systems will optimize the workflow of the staff. To streamline this, it is important that the use of specific ICT systems and workflows are documented. For example, the pandemic left many employees working from home. It is important that everyone knows how to reach each other, and documents are available in an easy manner. Currently, CoE BBE uses Microsoft Teams to communicate. In Teams, files can be shared using permissions so authorized individuals can reach the right documents.

2.3.9.4 *Shared values*

Shared values within a company are very important. Having shared values at work means that employees share common attitudes and principles. This will help build a shared interest in success (19). CoE BBE has a clear goal: helping businesses with their biobased ambition by working with them to innovate the higher vocational education (HBO) and conduct research that matters. The employees of CoE BBE have a clear shared value: working together on the transition of a biobased economy (2).

2.3.9.5 *Style*

This element is about the leadership style within the management. The style within the management has a lot of influence on the business and especially on the staff. Within CoE BBE, management has a personal relationship with the staff. It has a flat organizational structure, with few layers between the management and staff.

2.3.9.6 *Skills*

Skills are about the strengths of a business. The strength of CoE BBE is their diverse staff and relationship with Avans Hogeschool. CoE BBE has a lot of employees with different backgrounds as a lot of the people working at CoE BBE are teachers with a different expertise. One of the main skills of CoE BBE is their diversity and interdisciplinarity. With their wide range of skills and knowledge, a wide range of projects and research can be conducted.

2.3.9.7 Staff

CoE BBE has many different employees with a variety of backgrounds. There are a lot of different aspects when it comes to the development of Biobased projects such as the Christmas baubles. At CoE BBE, the team is diverse, has great interest in the circular economy and has many different educational backgrounds, which is important to evaluate every aspect within projects (20). CoE BBE also has employees working at the BAC (Biopolymer Application Centrum), who are working on research and development regarding biopolymers. The other part of the staff consists of portfolio managers, project managers, marketing and communication and the top management.

2.3.10 Business domain definition

The customer dimension includes the needs and expectations of the target segmentations concerning the product (21). One of the most important customer needs that must be considered is the need for a more sustainable and environmental Christmas holiday and season whilst maintaining the current level of comfort.

Moreover, research showed that segmentations value reliable and fairly priced products, a good quality of the product, a personal connection to the product (which include social and environment responsibility), a transparent brand and product, and great customer service. The group contains a description of the customer segmentations that will be targeted during the marketing of the product (22). The customer groups are students and employees of universities in the Netherlands.

The three different target segmentations are Generation X, Millennials and Generation Z, specifically within the Avans environment and at other universities whenever upscaling may apply. In the technology dimension, materials of the product that must be included in order to satisfy the needs of the customers are included (22).

To satisfy customer needs and make Christmas more environmentally friendly and sustainable, Ballsy may be produced and finalized for sale. To produce the baubles, several steps are required such as the collection of the pine needles, the drying and sifting of the needles which continues into the shredding and cooling of the pine needles, adding the preferred color in the production process and molding this into two halves (23).

2.4 SWOT ANALYSIS

Based on the information from the internal analysis in 2.3 the micro environment and the information retrieved from the competitor analysis that can be found in Appendix V, the strengths, weaknesses, opportunities and threats of Ballsy were determined and a SWOT was created. By using this analysis, the organization's best advantage was determined, and chances of failure can be reduced (34). The SWOT of CoE BBE can be seen in Table 2.

Table 2 SWOT analysis

Strengths	Weaknesses
Reasonable prices as there is no intention of making profit	No in-depth knowledge of the potential target group
Great access to production materials because of multiple stakeholders involved	The biobased Christmas ball will only be available in one design (shape)
Specific market focus, students and employees of schools	The future product has no market presence or reputation yet
The Centre of Expertise Biobased Economy has well-trained staff with an expertise in the biobased economy	This product is a seasonal product. The costumers are not attracted to product outside of the Christmas season
The creation of the biobased Christmas baubles creates new market opportunities	The term 'biobased' can be hard to understand

Complete focus on the biobased economy and sustainable environment	Potential skepticism regarding environmental claims
Opportunities	Threats
Rising demand of sustainable products	The market is unknown, and demand might be low
Review production techniques to produce Christmas baubles in new colors and shapes, and increase market share	Target group is not aware of the negative environmental influences that Christmas brings, and the demand might be low
Making Christmas more sustainable in the near future	The biobased Christmas ball may not have the desired appearance, which might influence the potential sales
Indirect competitors may be slow to the adaption of Biobased technologies	Competitors have a larger product range and can implement biobased Christmas baubles in the future into their assortment
Raise more awareness on the importance of a sustainable, biobased environment and Christmas	Target group has not much knowledge about the importance of a more biobased environment
There might be possibilities for upscaling in the future; The development of other biobased Christmas decorations	Shortage of pine needle feedstock. Since pine needles are a waste stream, the amount of this feedstock can vary every year, so it is possible that this will become a scarcer product. Especially since people buy fewer real Christmas trees

3 THE MARKETING PLAN

This chapter contains the marketing plan of Ballys. This marketing plan has been made by means of desk research, quantitative research and qualitative research from students and employees of Avans to retrieve more detailed information.

3.1 LIFESTYLE SEGMENTATIONS AND PERSONA

In this business plan, students and employees of universities are targeted, starting with a focus on Avans students and employees in the first years. Additionally, students and employees of other universities in the Netherlands can be incorporated when upscaling becomes applicable. The average age of the students and employees of Avans varies from 16 until 56, more data can be found in Appendix VI. Target segmentations were based on 3 type of generations, namely Generation X which are born between 1961 and 1980, Millennials which are born between 1980 and 2000 and Generation Z which are born between 2000 and 2015 (24).

Based on the detailed information obtained from desk research, quantitative and qualitative research personas have been created. A persona is a fictional character and represents the different user types that might use the product. A persona will help to understand users' needs, experiences, behaviour and goals (25). To create these personas, data and knowledge about the target groups (Appendix I) was retrieved and analyzed. Additional data about the target group was gathered by surveys and interviews, which can be found in both Appendix VI and Appendix VII.

Three personas were created to fit the target segmentation. Each persona includes the following: Age, Occupation, Location, Hobby, Biography, Goals & frustrations, Personality description and Affiliated brands.

Generation X is represented by Marieke, a 52-year-old teacher from Oosterhout (Figure 5). Marieke finished a bachelor prior to her teaching career at Avans. She values family greatly and likes to shop by visiting stores.

Marieke's goals entail a good work/life balance, keeping up with technology and values working hard.

She is primarily frustrated by technological developments that sometimes feel too fast or unnecessary.

Marieke is an achiever, caretaker and values her independence.



Figure 5 Persona generation X.

Millennials is represented by Daan. He is a 22-year old student living in Breda (Figure 6). He studies physical therapy and enjoys tracking his physical fitness progress. Daan values researching brands prior to purchasing as he does not instantly believe online advertising.

Daan wishes to stay up to date with global developments, achieve his personal goals and to experience genuine moment. He is frustrated when he is confronted with brands that focus on old business models and refuse to incorporate sustainability. Daan is very ambitious, empathic and enthusiastic.



Figure 6 Millennials persona.

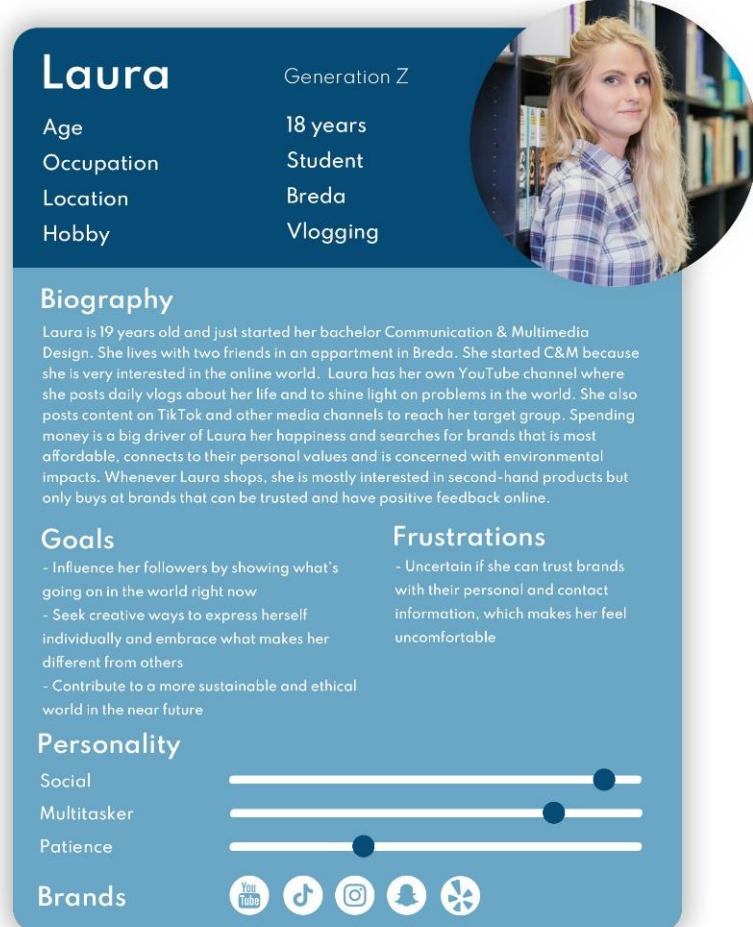


Figure 7 Generation X persona.

Generation Z is represented by Laura. Laura is an 18-year old student at Breda (Figure 7). She studies communication & multimedia design and enjoys sharing her experiences online.

She wishes to influence her followers, seek creative ways to express herself and to contribute to a sustainable planet. Frustrations occur when she feels unsure in trusting certain brands.

Laura is a very social individual, likes to multitask and is very patient at heart. She can mostly be found on YouTube, TikTok, Instagram and snapchat.

3.2 CUSTOMER JOURNEY

Customer journey research helps to better tailor services to wishes and needs of the customer. In the customer journey research, the customer journey is mapped out based on the perspective of the potential customer as a starting point and in-depth and substantiated insight to optimizing the services (26). The customer journey was based on the qualitative research that can be found in Appendix VII. The customer journey of the target segmentations was based on information from their customer journey when buying normal Christmas baubles, as Ballsy was not introduced yet. The customer journeys for the biobased Christmas baubles can be seen in Figure 8, Figure 9 and Figure 10.

3.2.1 Generation X

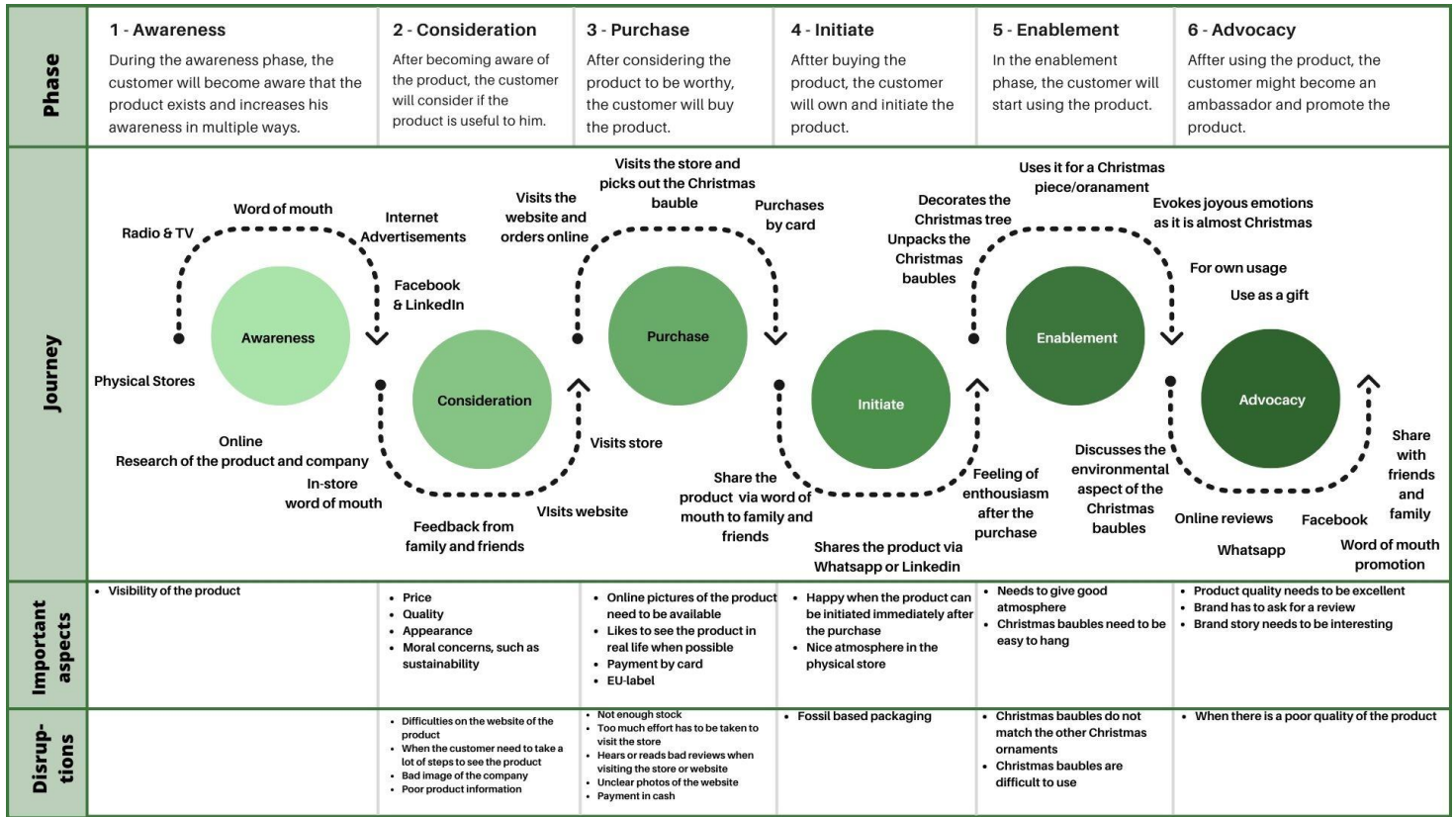


Figure 8 Customer journey Generation X

3.2.2 Millennials

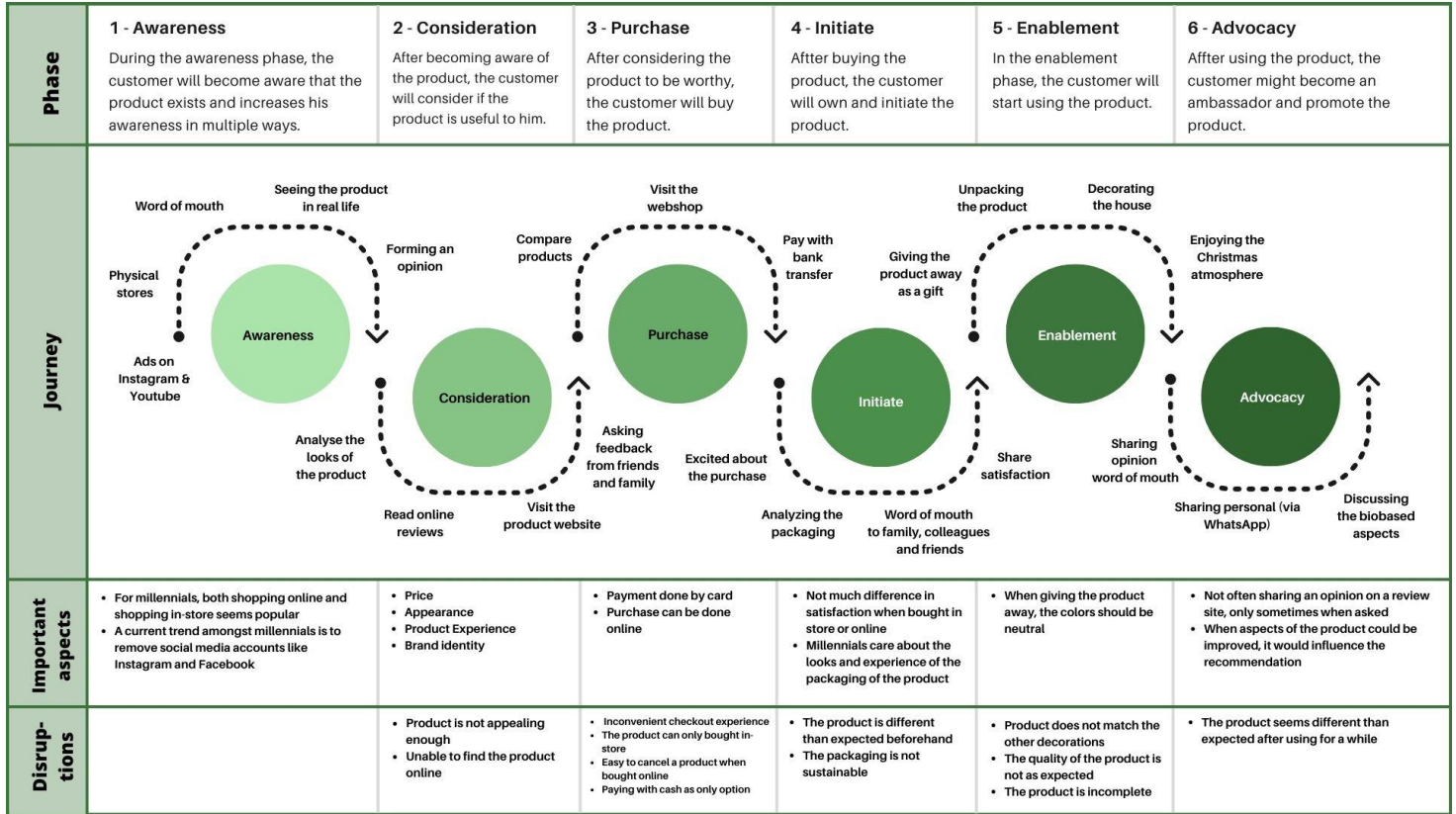


Figure 9 Customer journey Millennials

3.2.3 Generation Z

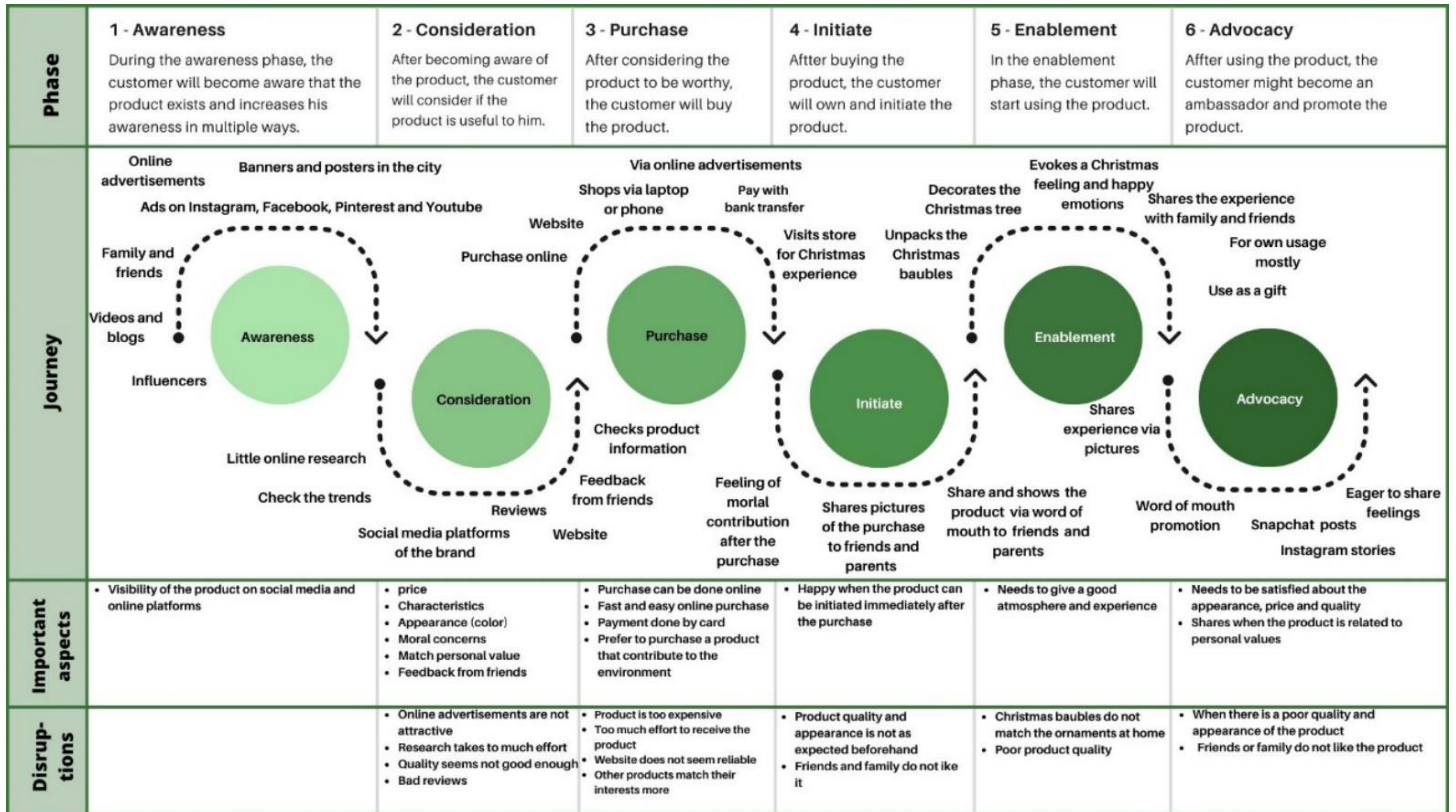


Figure 10 Customer journey Generation Z

3.3 BRANDING

To introduce Ballsy, it is important that brand image is created. This can be done by using four important aspects, by defining how you want to be perceived, by organizing the business based on that value proposition, by communicating this value proposition and by staying consistent. For Ballsy, the value proposition consists of creating biobased awareness and creating Ballsy for a more sustainable Christmas. To build a strong image, tagline, brand mantra and brand story were created.

3.3.1 Tagline of the brand

A tagline is a phrase that accompanies your brand name to quickly translate your positioning and brand statements in a few memorable words that provide an image of the brand offerings, promise and core values. The tagline is memorable, short, conveys the brand point and differentiates The Centre of Expertise and the biobased Christmas baubles from competitors (27). The tagline that captures the biobased Christmas baubles is: *'Be Ballsy, buy sustainable'*.

3.3.2 Brand story

A brand mantra is a short statement that expresses the core of what the brand represents. It communicates the emotional associations that tries to inspire a connection between the customer and a brand (28). The brand mantra will connect with the value proposition of Ballsy and is based on the number one goal of this product. The brand mantra for this product, will therefore be stated as: *Become aware – think biobased – enjoy a green Christmas – make a change*

Besides a brand mantra it is important to create a brand story, which describes who the brand is and what it wants to convey. The brand story makes sure that a meaningful connection with people and future customers will be created. It specifically defines the relationship between the brand and customer (29).

Christmas has been celebrated for many years and is still one of these biggest and most important holidays during the year. It started as a Christian festival for celebrating the birth of Jesus on December 25th but nowadays can be seen as a holiday season that is celebrated by almost everyone in the world. Cities, houses and Christmas trees are being decorated, families and friends gather for dinner, wish each other happiness and celebrate the coziest time of year. However, one thing does not come into mind: Christmas is not sustainable and has a negative influence on the environment.

We buy new clothes, prepare a lavish Christmas dinner, and mostly bring home a Christmas tree every year that is decorated according to the latest trends. CoE BBE wants to contribute to sustainability and the environment by inventing Ballsy and creating biobased awareness among communities, cities and many others. By offering the biobased Christmas baubles, we want to give people the thought of still enjoying the coziest time of the year whilst contributing to the environment. We as a brand believe that customers can discover new horizons, become inspired and educated regarding sustainability to improve the environment while experiencing the most beautiful and happiest time.

3.4 TARGETING STRATEGY

The target strategy involves segmenting the market, determining which segments of the market are appropriate (30). In this business case, a concentrated targeting strategy will be implemented to reach the target segmentations at Avans university. By adapting the concentration strategy there will be a focus on its marketing efforts on only defined and specific market segmentations. By implementing the concentration strategy, a thorough research and analysis has been conducted on the needs and wants of only specific target segmentations. In this way, the company can focus on all their efforts to satisfy the needs of the specific segments and can provide a differential advantage over other organizations that market this segment. The concentrated targeting is particularly effective for small companies with limited resources as it does not require the use of mass production, distribution and advertising (31) which makes this strategy a perfect fit with CoE BBE.

3.5 POSITIONING STATEMENT

The positioning matrix is a tool that helps to define the essential element of the brand’s positioning and guides the importance of each element based on the specific marketing environment and competitive challenge a brand is faced with (32). Within this positioning map, two important elements were considered based on the qualitative research of the target segmentations and the competitive challenge that CoE BBE faces.

The two elements that were considered are: production of biobased Christmas baubles vs fossil-based Christmas baubles (as this is an important value for the target segmentations according to the qualitative research) and the production of a wide range of Christmas baubles vs a low range of baubles (as this is a competitive challenge that CoE BBE faces since most indirect competitors have a large assortment of Christmas baubles in different materials, colors and shapes). The positioning map can be viewed in Figure 11.

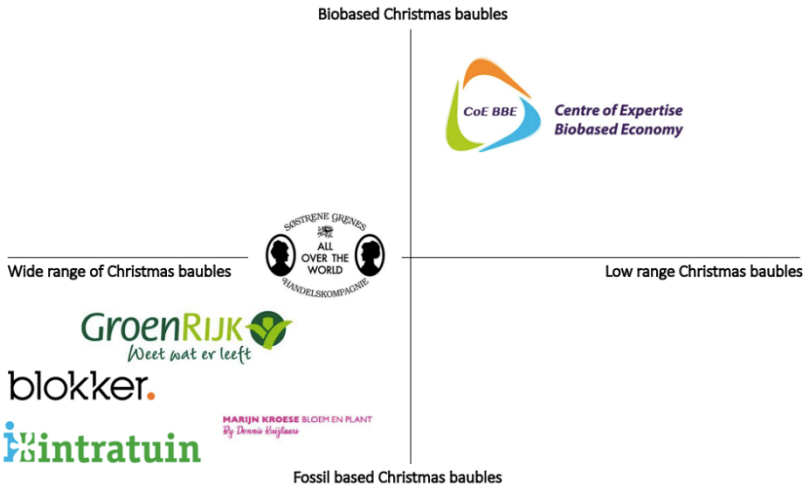


Figure 11 Positioning matrix

Based on this positioning matrix it can be perceived that CoE BBE is the only company producing biobased Christmas baubles, but have a low range of Christmas baubles. As depicted, Søstrene Grene is placed in the middle between non sustainable and sustainable products as they have a lot of 'Do it yourself' Christmas decorations which can be made with, but also have a large assortment of Christmas baubles made from plastic and glass. The other competitors offer a wide range of Christmas baubles in many shapes, sizes and colors but only offer Christmas baubles produced from materials such as glass and plastic which are not biobased. From the positioning matrix it can be concluded that The Centre of Expertise has an important unique selling point which distinguishes the product from its indirect competitors, which is the contribution to a biobased and circular economy.

3.5.1 Market positioning value discipline model

To specify the market positioning of the Ballsy, a focus was made on one discipline from the discipline model of Treacy and Wiersema. While most companies pursue on making their products efficient and profitable it is advisable for CoE BBE to pursue the strategy of customer intimacy and continually tailor and shape the products to fit the customer. Companies that focus on customer intimacy spend more time on the customers' needs and wants and build customer loyalty over the long term (33).

To achieve this discipline, it is important to focus on several strategies such as being a customer-first company where you make sure that the very first customers are put in the center of the company culture. Besides this, it is important that CoE BBE focusses on customer service and aligns their organization through empathy and ensures that every employee within the company listens to the customers' needs, wants or problems and responds to this. One of the most important factors to implement in customer intimacy discipline is to understand the stages that the client goes through when buying the biobased Christmas baubles and anticipate to the clients' needs within the customer journey, found in 3.2, to deliver the product.

To maintain the intimate customer relationship, it is important that CoE BBE ensures that the Christmas baubles continually answer the clients' needs and stay connected with them by using data analytics through every client interaction. Through data from, for example, promotional campaigns there is an opportunity to fine-tune the segmentations and serve them better. The more customer focused CoE BBE's strategy becomes, the closer customers will feel to your brand, increasing brand loyalty (34).

3.6 MARKETING MIX

For the implementation of the marketing mix it is important that CoE BBE takes the consumers' needs and wants into consideration rather than the product itself. The 4C model was used to describe the marketing mix of the organization. The marketing mix is the basis for further marketing decisions and views the marketing strategy from the consumer's point of view. Thus, creating a marketing strategy where the customer is central within the company (35). The success of the company depends on how satisfied the customers are. A small company like CoE BBE is likely to survive when considering this.

3.6.1 Customer solution

It is important to think about the problem that the customer has before purchasing the product (35). Based on desk, quantitative and qualitative research that can be found in Appendix I, VI & VII it can be concluded that a majority of the generations value sustainability when they purchase a product or service and are in favor of companies that contribute to the environment in a positive way. A problem that consumers have before buying Ballsy is mainly that they are unaware of the fact that they are overconsuming during the Christmas period and negatively influence the environment.

As CoE BBE will introduce the product to the market and wants to convey the message that the Christmas holiday can be more sustainable, awareness is being created among many potential

customers and have the ability to purchase biobased Christmas baubles that will decrease their negative impacts and contribute to a more sustainable holiday season, which will solve the customer problem for Generation X, Millennials and Generation Z. To actively explore and identify the nature of the customer solution further, three different types of products were considered and discussed: the core, tangible and augmented product of Ballsy.

3.6.1.1 *Core product*

The core product, also called the benefit of the product is about identifying the value and the feeling that the customers have when he or she is purchasing the product (36). Based on the qualitative research that it can be concluded that a majority of the target segmentations are very satisfied when they purchase and initiate Christmas baubles as it evokes excitement and happy feelings since they are looking forward to the Christmas period. Everyone is looking forward to decorating the tree and to spend this cozy and special time with family and friends, which is valuable to them. Besides the fact that Christmas baubles are beneficial to the atmosphere around the Christmas season, most of the potential customers value a product that contributes to the environment and want to make responsible purchases. Ballsy is environmentally beneficial for the target segmentations since the product is produced with biobased materials and contributes to increased biobased awareness.

3.6.1.2 *Tangible product*

The tangibility of the product reflects on the quality, features, styling and packaging of the biobased Christmas baubles (36). Ballsy will offer a great quality to the customers as every aspect of the Christmas baubles has been produced with biobased materials, such as pine needles collected from a waste stream and biopolymers. These materials are also the most significant features of the product. Besides this, the styling of the product and the packaging is related to the Christmas season and will include colors such as green, brown-goldish, white and look alike silver to make the Christmas tree and the Christmas experience even more special. On the custom-made packaging, customers will find information about the product specifications. There is a short explanation about the meaning biobased and every single polymer is explained on the packaging. All suppliers and partners working on the product and some inspirational quotes, which are enjoyable to read, are also included.

3.6.1.3 *Augmented product*

The augmented product is the supporting services surrounding the product (36). To purchase the product, the customer must visit the website of 'biobasedkerstbal.nl' and order them online. After this the customer can pick up and purchase the set at the cafeteria of Avans university. The supporting service of Ballsy is the website used to order the product online and the customer care of the employees within the cafeteria that help customers with the pick-up and purchase. An additional supporting service is the pick-up point within the university itself. Students and employees visit the university on a daily basis and picking up the product will take less effort compared to other locations.

3.6.2 *Cost to the customer*

The cost for the customer is not only the sales price of the product, but also the required effort to purchase the product (35). The pricing strategy for Ballsy is explained below. Besides the fact that the customer purchases the product for a price of €7.12 they also have to put in some effort to purchase and collect the product. Within the qualitative research, a majority of the interviewees mention that they take the effort which they have to make to purchase and receive the product into account.

To receive the product, the customer can order it online, which is convenient for a majority of the target segmentations as the internet is integrated into their lives. They will have to purchase and collect the Christmas baubles on campus at the cafeteria of Avans university. Every customer has to take an effort to travel to the university and to collect the set. However, this cost (the effort that a customer has to make to collect the Christmas baubles) has been considered by being able to collect the product at school, where most customers can be found on a daily basis for classes and work.

3.6.2.1 Pricing strategy

The strategy that is used for the biobased Christmas baubles is called penetration pricing. Penetration pricing is a marketing strategy used by businesses to attract customers to a new product, in this case, by offering a low price of €7.12 during its initial offering. The lower price helps the product penetrate the market and attract customers away from the indirect competitors. The market penetration strategy relies on the use of lower prices to make a wide number of customers aware of the product. The goal of this market strategy is to seduce customers to try out the product offering and build a relationship with the customer, increasing both market share and sales volume (37). By implementing a low price for Ballsy, the Centre of Biobased Economy will not only attract a higher number of customers but will also scare the competitors when Ballsy is introduced as a new innovative and affordable product. In this business case, CoE BBE does not strive to be profitable. As they are a non-profit organization, they strive to achieve break-even and have the ability to offer a high-quality product with favorable pricing for the customers. Detailed information about the product pricing can be found in 4.1.

3.6.3 Convenience

Consumers nowadays want to approach the product or service as easily as possible at places and times that suit them best. When customers have to put in extra effort, they are more likely to drop out (35) as mentioned in Appendix VII. It is very convenient for the customer that the product can be collected at Avans university.

Besides collecting the biobased Christmas baubles at Avans it is important to not only look at where the product is for sale, but also the ease of obtaining the product. To obtain the product, the consumers can order the sets of biobased Christmas baubles online via the website which is clear and easy to use. Afterwards, they can purchase and collect them at Avans university to avoid crowdedness as consumers will consider the purchase of the product via the online website first. An overview of the distribution scheme can be found in Figure 12.

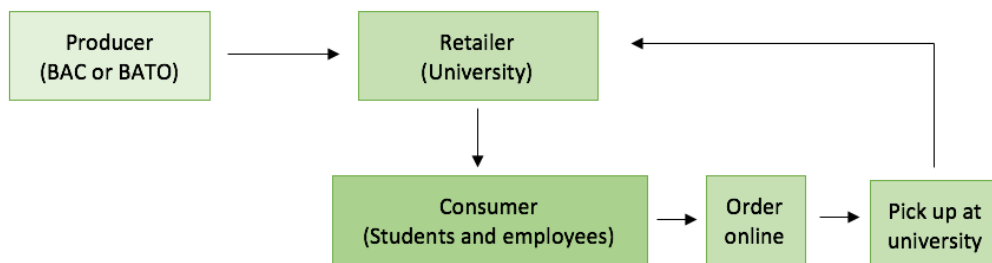


Figure 12 Distribution channel scheme

3.6.4 Communication

The customers must be seen as individuals and the company has to build up a relationship of trust through individual approaches (35). By implementing a communication plan for CoE BBE, preferred communication channels of the customer segmentations have been taken considered by means of desk research and qualitative research (Appendix I & VII). Communication will be mainly executed using social media channels of Avans university, Avans platforms, online and offline advertisements and the website of the biobased Christmas baubles with a call to action button and a good appearance.

Customer service must be integrated into the website that provides care to the visitor which may ask questions about the product (35). Detailed information on the used communication channels will be given below. Information is also provided regarding the suggested style and tone of voice used in the media channels.

3.6.4.1 Online communication channels

By implementing a digital marketing communication strategy, it will be possible to make the target segmentations aware of the product. Within this digital marketing mix owned, earned and paid media will be considered and, to optimally market the product, it is important to leverage them all (38). An overview of the necessary means of communication for introduction and sales of Ballsy can be seen in Table 3.

Table 3 Necessary means of communication channels

Overview of the necessary means of communication for the biobased Christmas baubles	
Owned media	-Social media channels (Instagram of Avans & Facebook of Avans) -Avans platforms (Blackboard, Microsoft Teams & Outlook e-mail) -Punt magazine -Website -SEO
Earned media	-Reviews
Paid media	-Email marketing -Social media advertising (Facebook, Instagram)

3.6.4.1.1 Owned marketing

Starting with owned media, The Centre of Expertise Biobased Economy has the opportunity to communicate with customers via owned media as they have control of them, and do not need to pay for primary usage (38). They can communicate via social media platforms, informational platforms, email, magazines and websites. As mentioned earlier, CoE BBE will introduce the product at Avans universities. Avans university has a wide spectrum in case of communication, which can attract the younger generations. As mentioned in the desk research and the customer journey that can be found in Appendix IV and Chapter 3.2 every single target segment has another way of receiving information about products and brands and thus becoming aware. The younger generations are more active on social media platforms Instagram, Facebook, Snapchat, YouTube and more, whilst Generation X is mostly becoming aware via television, radio, e-mail and offline channels.

Avans university is active on different social media channels to communicate with students and employees which can be used for the introduction of Ballsy. The owned channels that are advisable for CoE BBE to use to increase brand awareness can be found in Table 3 and are explained below.

Facebook and Instagram are the most used social media platforms in the awareness phase of Millennials and Generation Z, which can be seen in 3.2 The customer journey and are also well-known social media channels of Avans university. The Instagram account of Avans is run by students themselves and monitored by the media manager within Avans. On this social media channel, it is easy for students to communicate with each other by commenting, sharing of messages and thus will spread the word online fast. The messages and posts of Avans are very diverse on Instagram and vary from sharing serious news announcements to sharing national and international student experiences and informing followers about their study, projects and school environment (39).

Avans has a range of 7.500 followers on Instagram and 22.705 followers on Facebook (39) (40). It is therefore attractive for The Centre of Expertise Biobased Economy to use these Avans social media channels and raise awareness among potential customers. It is important that they become familiarized with the brand. It is therefore wise for CoE BBE to introduce the Christmas baubles on these social media channels by informing the customer segmentations about the production process, the function of biobased products and the biobased Christmas baubles, the advantages of the bauble and the appearance of the bauble via photos and videos. Using Avans social media channels in the introduction phase is a great chance to advertise on a large scale and to reach a lot of potential customers immediately and increasing the biobased awareness, which is the main goal.

Besides digital posts on the mentioned social media platforms it is advised to use Avans communication platforms namely Blackboard, Microsoft Teams and Outlook e-mail. These platforms are being used by Avans students and employees daily to provide and search for necessary information about lectures, workshops and daily news about the university itself. Most students and employees will communicate and connect through these platforms daily, it is a great opportunity to spread information and post about the introduction of Ballsy targeting all segmentations.

Another platform that can contribute to the introduction and sales of the biobased Christmas baubles is Punt magazine. Punt magazine is a completely independent magazine which is owned by Avans university and available for students and employees of Avans to read. Via Punt magazine, readers are being updated about the main highlights about activities and projects going on at Avans. In this way everyone is being updated via articles and interviews with Avans students and/or employees and can gain more insight into new activities. Punt magazine already published an article about the biobased Christmas baubles to increase awareness on the overuse during Christmas and the possibility to contribute to a more sustainable Christmas (41) and can be a useful promotion platform to provide more insights about the launch of the product.

The website of Avans university can be used to promote the sales of product. The website of CoE BBE can be used to promote the biobased Christmas baubles as well by providing more in-depth information about the production process, product characteristics and appearance. Moreover, it is important that both sites provide a click-through link to the website of the biobased Christmas baubles. CoE BBE just developed their own website 'biobasedkerstbal.nl' that can be used as main website-based promotion of the product. At the moment, potential customers find an extensive explanation about the product specifications, their partners and the used biobased materials, together with the possibility to order the biobased Christmas baubles (42). It is important for The Centre of Expertise Biobased Economy to develop the website as a responsive website design, which means that the layout of the page grows or shrinks based on the resolution of the screen the user has (43). Because of this, customer segmentations can visit the website via de laptop and mobile phone, which is important as Generation X is most likely to order via laptop, while Millennials and Generation Z are more likely to shop on a mobile device. With the development of a responsive design, the company only needs one website that is adjustable for desktop and mobile device (43).

To optimize the number of visitors on the landing page of the website of 'biobasedkerstbal.nl' it is important to implement SEO optimization. SEO is a vital and digital marketing tool as it makes the website more visible, which means that there will be more traffic and more opportunities to convert prospects into customers. Beyond that, it is important to raise brand awareness, build relationships with potential customers and to position the company in an attractive way. Crucial elements for the implementation of SEO is to well-research, choose and use keywords in the website content in order to be effective. Keywords are words and phrases that prospects use to find online content and that brands use to connect with prospects that are looking for their products. When searching for keywords to optimize your search engine optimization it is important to look for keywords that have high search rates and low competition and to choose short-tail, long-tail and local words, such as biobased, Christmas, Christmas baubles, biobased product, Breda, biobased Christmas etc. to implement into the content.

Content is another vital part of the SEO that is advised to be improved. To build a relationship with the potential customer it is important to provide valuable information. It is essential for CoE BBE to improve the web page content by implementing elements such as videos, a blog about the use of the biobased Christmas baubles, an infographic and social media posts. The content must be educational,

but also interesting, relevant, engaging and sharable to increase the number of visitors and sales on the website 'biobasedkerstbal.nl'.

Furthermore, it is crucial to include local SEO as this is becoming increasingly important since most of the target segmentations use mobile devices such as smartphones and tablets for their daily product search. Local SEO will ensure that people around the area of Avans university will come across the webpage of the biobased Christmas baubles when looking for Christmas baubles by using local keywords and creating pages for the company on Google my business and Google maps (44).

3.6.4.1.2 Earned media

To take advantage of earned media it is important to develop and include a review page on the website of 'biobasedkerstbal.nl'. As mentioned in the desk research and the qualitative research, Millennials and Generation Z consider a product more when this is recommended via review sites. By implementing a review page, customers can evaluate the product, but also read the experiences of others before making their purchase. This earned media channel can provide significant value, as it is created by real customers which can build trust with new leads and potential customers.

3.6.4.1.3 Paid media

To optimize digital marketing, it is important to include paid media. As mentioned in the customer journey in 3.2, Generation X is mostly becoming aware via physical stores, word of mouth, radio and television advertisements, internet advertisements and some social media channels such as Facebook and LinkedIn. Besides this, desk research has shown that Generation X significantly uses their email on a daily basis and because of this CoE BBE could create more personal profitable relationships by using email for acquisition, retention, loyalty and branding (38). As social media platforms such as Instagram and Facebook are mainly used in the awareness phase of Millennials and Generation Z and Facebook is also used by Generation X it is advisable to make use of these channels by implementing paid advertisements.

During the introduction phase of the product it is not advised to make use of radio, television advertisements (excl. Avans screens), SEA, affiliate marketing and display marketing. As the company is a start-up, it is important to focus on the owned and earned media channels first and to not invest too much in paid media channels besides email marketing and social media marketing to increase the number of followers, the conversion rate of the website and the number of customers and sales.

3.6.4.2 *Offline communication channels*

Offline advertisements will be very useful for the introduction of Ballsy. As mentioned in the customer journey all customer segmentations do become aware via physical stores or banners and posters in their physical environment. It is an opportunity for CoE BBE to develop offline promotion materials such as posters and banners at the university, to draw the attention to students and employees within the school environment daily. Besides this, it would be effective to develop specific advertisements to show online advertisements on the information screens at the university as many students and employees walk past these information points multiple times daily and increases the awareness and sales of the biobased Christmas baubles. This option is only considered when most students can be admitted at university again and when the current situation of Covid-19 has changed significantly.

Besides this, the mentioned owned, earned, paid and offline communication channels will not only be applicable within the Avans environment, but will also be appropriate to use at other universities whenever upscaling becomes applicable in the upcoming years.

3.6.4.3 Guiding principles of communication

To attract potential customers, it is important to translate brand values into guidelines for communication as the tone of voice reflects the brand personality, helps to connect with the audience and distinguishes the brand from competitors (45). The right tone of voice and style must be used for all communication channels to clearly transfer what the Company stands for.

The message which The Centre of Expertise Biobased Economy would like to convey is that people can become more aware of biobased materials like the Christmas baubles and can contribute to a positive impact on the environment. It is important that people become aware of the over consumption during the Christmas holidays, as people purchase many presents, clothes, food and decorations.

The target group ranges from 16 until 56. From the desk research and qualitative research, it can be concluded that a majority of the target segmentations use social media and other online communication platforms on a daily basis, where a tone of voice is usually more casual and informal. The tone of voice of the online communication channels in Chapter 3.6.4.1 is casual but with a relatively serious note to create credibility and trust. The tone of voice should be respectful, enthusiastic and convincing to make the Ballsy attractive. Additionally, every message must be written in a persuasive and active style as the target segmentations need to create a feeling that they would like to contribute to a more sustainable Christmas and a biobased economy and thus want to purchase the product. To engage with the target segmentations, creation of online messages that consist out of questions, anticipate their needs and build a connection are required.

To give the communication material form, a stylesheet was created (Figure 13). A stylesheet is a display and overview of the fonts and colors that should be used when creating promotion material for the target groups. Usually, the headers and main text have a different font to distinguish them. In this case, the font Montserrat is used for the headers. The font Lato is used for the main text. The communication materials also consist of the same colors to make sure that the promotion of the brand is recognizable and consistent. In the stylesheet, five colors are chosen based on existing materials like the packaging and website of the biobased Christmas baubles. The color codes are displayed in HEX at the bottom of the stylesheet.



Figure 13 Stylesheet

3.7 CAUSE RELATED MARKETING

To potentially increase the number of customers, research has been executed regarding the involvement of charity, also called cause related marketing (46). Many customers are more likely to purchase a product that involves a good cause and are, likewise, willing to purchase more for a product that involves a good cause. This information is derived from Appendix VI. Christmas is a feast for many families but also a period where we must consider others going through a harder time than most of us and need some help. Working together with a good cause means that a percentage of the sales price (20%) is donated, helping the organization and individuals in need. By involving a charity in the sales of the biobased Christmas baubles awareness is not only raised regarding environmental aspects but also regarding social aspects.

As the sales of Ballsy are related to Christmas, a charity linked to the Christmas season is advised, which is called 'Rocking up X-mas'. Rocking Up X-Mas is a good cause which focuses on people who cannot celebrate Christmas properly due to financial constraints. Families that receive help from Rocking up X-mas are often also linked to the food bank. Rocking up X-mas prepares luxury packages to provide Christmas dinners and provides presents for both the children and the parents. The organization already has a good structured system where they work together with a team of volunteers who try to make 500 families happy all over the Netherlands (47).

Working together with a good cause and implementing cause-related marketing is an advantage for the good cause and for CoE BBE. It is great for Rocking up X-mas as they receive support via the sales of Ballsy and gain more publicity. It is also beneficial for CoE BBE to enhance their reputation and conceivably increase the number of customers and sales.

3.8 UPSCALING POSSIBILITIES

In the first 3 years The Centre of Expertise Biobased Economy will target students and employees and focuses on the sales within Avans university of applied sciences. After the sales and creation of biobased awareness at Avans university it is valuable to continue the creation of biobased awareness in other surroundings. It is a possibility for CoE BBE (or another entity) to upscale Ballsy and to introduce them to other universities. The target groups will remain the same and biobased awareness will increase within other universities.

Matter of course, not every university is eligible to work with. One of the most critical and important factors is their involvement with sustainability and environmental situations. Research shows that universities such as, HZ university of applied sciences, Hogeschool Rotterdam, Utrecht university, Vrije Universiteit Amsterdam, Hogeschool Van Hall Larenstein, Breda University of applied sciences and Wageningen University & Research (WUR) are the best fit to expand the distribution channels as they all have their focus on sustainability and the contribution to a more environmentally friendly world in common. WUR could be an especially interesting partner since they have a research institute focused on sustainable innovations in biobased products and are open to cooperate with similar knowledge institutes (48). Universities within this list and the closest proximity are generally speaking the most interesting initial scaling up steps. Detailed information about their sustainable contributions can be found in Appendix IX.

4 THE FINANCIAL PLAN

This chapter discusses the financial plan. It includes overviews of the revenue model, balance sheets, several budgets and ratios. For the related financial calculation file, we will refer you to the attached Excel document by the name of Business plan group I finance.

4.1 REVENUE & COST OF SALES

4.1.1 Revenues

CoE BBE will earn money through the sales of the biobased Christmas baubles. The total production costs of one set of baubles are €4.90 excl VAT. This is then multiplied by a profit markup percentage of 20%. This percentage was included as it is a requirement to be able to sell the baubles through Avans channels. The total price of one set of baubles equals €7.12 incl VAT. Sales in the year 2020 range from week 49 up until week 52 with an initial goal of 1000 sets to be sold within this timeframe. Revenues created within this timeframe are donated to a good cause and doubled by the CVB. CoE BBE has one page in which sets can be pre-ordered. Students and employees will then receive an e-mail when their product is ready to be picked up within the university. As CoE BBE is not interested in a profit but is interested in growth in terms of expanding to other universities, it is expected for CoE BBE to expand within the first few years.

4.1.2 Cost of sales

The costs for the materials, thus the biopolymers, pine needles, color dyes, packaging and printing that are shown in Figure 14 were derived from the contact with the suppliers. The general distribution costs of the baubles are, in general terms, €1.28 euros per set. This price consists of several distribution channels, those of the four different biopolymers to BATO, those of BATO to storage and those of storage to Avans university. As there is one main distribution channel from the final product to the customer, costs related to customer distribution are low. The estimate of distribution costs did not specify a specific handler or carrier but did assume this was incorporated for the biopolymers. The costs of packaging totaled at €0.36 euros per set based on the weight of the packaging. Application was incorporated within the BATO outsourcing estimate.

	Cost of sales per set of 4	Cost per bauble
<i>Fixed costs</i>		<i>Commercial (bulk) scenario</i>
Mold	€ 0.56	€ 0.14
Total fixed costs	€ 0.56	€ 0.14
<i>Variable costs</i>		
Bio-polyethen/miscanthus	€ 0.22	
PLA LX175	€ 0.22	€ 0.22
Solanyl C1201	€ 0.22	
Bio-polyethen SHA7260	€ 0.22	
Pine needles	€ 0.00125	€ 0.00031
Color dyes	€ 0.00049	€ 0.00025
Package material	€ 0.36	€ 0.09
Printing	€ 0.29	€ 0.07
Handling + outsourcing BATO	€ 1.52	€ 0.38
Logistics and distribution	€ 1.28	€ 0.32
Total variable costs	€ 4.34	€ 1.09
Total production costs per Christmas set/bc	€ 4.90	1.23

Figure 14 Cost of sales

Expected net sales	
Cost price	€ 4.90
Profit markup percentage (20%)	€ 0.98
VAT (21%)	€ 1.24
Sales price	€ 7.12

Figure 15 Sales price

4.2 INVESTMENT BUDGET

The investment budget, as depicted below, is the financial plan of capital expenditures. For CoE BBE these include marketing costs and will also entails the mold and the storage of the first year.

Investments in the first year will be focus on marketing to properly introduce the biobased Christmas bauble into the market, attract potential customers and increase market share. The marketing investments have been based on 20% of the revenue (basis case) that has been calculated in Figure 18, which is a total of €7.122 euros (49). The marketing investments are divided up into owned marketing via the Avans communication channels, such as social media and other communication platforms, the development and usage of the website and paid communication materials and advertisements. Paid marketing will be an important factor to optimize their digital marketing and increase online leads. As most marketing will be implemented via owned marketing (Avans channels) costs will be saved.

Besides the marketing investments, investments will be made on the mold. In consultation with Bas Koebrugge and the mold supplier Moulds and More, the cost has been indicated €14.000, of which depreciation will be calculated per bauble and included in the production costs.

Likewise, an investment in storage has to be made in order to store the biobased Christmas baubles after production. These storage racks are based on the size of the packaging and the period in which the Christmas baubles will be produced.

Investment requirement (excl. VAT)	
Development Marketing strategy	€ 1.424
Communication channels	
_Website	€ 997
_Social media channels Avans	€ 0
_Avans platforms and magazines	€ 0
Communication materials and advertisement	
_Email marketing	€ 142
_Social media advertising	€ 285

<i>Mold</i>	€ 14.000
<i>Storage (1 year)</i>	€ 600

	€ 14.600
<i>Cash and cash equivalents</i>	_____
	€ 25.000
Total Investment	€ 16.024

Figure 16 Investment budget

4.3 FINANCING BUDGET

The financing budget includes the financing plan for the previously mentioned investment budget. In the case of CoE BBE this entails a cash contribution from the government of €25.000.

The RVO (Rijksdienst Voor Ondernemend Nederland) aims to support entrepreneurs, improve collaborations, strengthen positions and helps realize national and international ambitions with funding, networking, know-how and compliance with laws and regulations (50). The RVO has different subsidies and programs for entrepreneurs. For this project, a subsidy of €25.000 was received from TKI-BBE (Stichting Topconsortium voor Kennis- en Innovatie Biobased Economy). A TKI (Top consortium for Knowledge and Innovation) is a program in which knowledge, risks and investments can be shared. The TKI-BBE aims at using residue from agriculture for non-food purposes (51). The amount of the subsidy is based on the amount of money a business invests in research (52).

Financing requirement	
Cash contribution	€ 25.000
Total equity	€ 25.000

Figure 17 Financial budget

4.4 FINANCIAL SCENARIOS

Within this chapter an elaboration on three different financial scenarios will be provided for The Centre of Expertise Biobased Economy. These consist of a basis case, best-case scenario and worst- case, which can be seen in Figure 18. For every scenario, the investments, sales, variable, - and fixed costs, and revenue has been calculated in order to provide a clear overview on the different production cases.

The basis case scenario is the average scenario and is the scenario which is most likely to occur. The financial results of this basis case represent a realistic scenario. The basis case scenario of 1000 sets per year has been discussed with Bas Koebrugge from CoE BBE and has been based on the number of sets that was expected to be produced in the first year.

This scenario was used in estimating cash flows (liquidity budget, balance sheets) of CoE BBE over a three-year time period. It assumed all inventory is sold within a short timeframe (high turnover).

The best-case scenario is the ideal financial scenario and the optimal case, but everything must run smoothly to achieve this. This best-case scenario will produce 2000 sets and thus double the revenue compared to the basis case scenario with €14.243. When the best-case scenario is achieved, a higher revenue will be made.

The worst-case scenario is the opposite. In this scenario, the most severe outcome will be considered and will result in decrease in revenue. As showed in below, it has been indicated that the worst-case scenario produces 500 sets in the first year and thus generates a revenue of €3.561.

Variables	Best case (2000)	Basis case (1000)	Worst case (500)
Investment	€ 18.049	€ 16.003	€ 15.012
Sales	2000	1000	500
Variable costs	€ 4,34	€ 4,34	€ 4,34
Fixed costs	€ 18.049	€ 16.003	€ 15.012
Revenue	€ 14.243	€ 7.122	€ 3.561

Figure 18 Financial scenarios

4.5 BALANCE SHEETS

The balance sheets serve as a means to assess the company's financial position and displaying owns and owes. The balance sheets show the status at the start and end of each fiscal year. The fiscal year of each balance sheet is from October 1st of the starting year up until September 30th of the following year. Fiscal years were used due to the seasonal nature of the product.

4.5.1 Content

The balance sheets include the following main points; Inventory, Bank, Marketing budget, Website, Revenue, Total cash equivalents, Loan mold, Supplier fees and Equity. The inventory was based off of a projection of sales by the client, it is assumed all units from inventory are sold prior to the start of the new fiscal year. The value of the inventory was derived from the cost of production of the product. The total cash equivalents and the subsequent components were derived from the investment budget.

The loan mold refers to the injection mold used in the production process. This was originally a gift, but as the client requested an entirely commercial scenario without any subsidies or gifts, the original price of the mold was incorporated as a loan. This loan is included in the cost price of the baubles using a straight-line depreciation.

The supplier fees are a summary of the total costs related to producing the stock (reason why it equals the inventory value). It consists of All values mentioned in the cost of sales. Total liabilities are equal to the sum of the loan and supplier fees.

4.5.1 Year 2020

1/10/2020			30/09/2021		
DEBIT			CREDIT		
Post	Amount	Unit	Post	Amount	Unit
Fixed assets			Equity	2,024 €	
Inventory (1000 sets)	7,122 €				
Total	7,122 €		Liabilities		
Current assets			<i>Long term loan</i>		
Bank	14,600 €		Loan mold	14,000 €	
Marketing budget	427 €		<i>Short term loan</i>		
Website	997 €		Supplier fees	7,122 €	
Revenue	0 €		Total liabilities	21,122 €	
Total cash equivalent	16,024 €				
Total	23,146 €		Total	23,146 €	

30/09/2021			30/09/2021		
DEBIT			CREDIT		
POST	Amount	Unit	Post	Amount	Unit
Fixed assets			Equity	2,157 €	
Inventory	0 €				
Total	0 €		Liabilities		
Current assets			<i>Long term loan</i>		
Bank	14,600 €		Loan mold	13,440 €	
Marketing budget	0 €		<i>Short term loan</i>		
Website	997 €		Supplier fees	7,122 €	
Revenue	7,122 €		Total liabilities	20,562 €	
Total cash equivalent	22,719 €				
Total	22,719 €		Total	22,719 €	

Figure 19 Balance sheet first fiscal year.

4.5.2 Year 2021

DEBIT			CREDIT		
Post	Amount	Unit	Post	Amount	Unit
Fixed assets			Equity		
Inventory (1250 sets)	8,902 €			2,157 €	
Total	8,902 €		Liabilities		
Current assets			<i>Long term loan</i>		
Bank	14,173 €		Loan mold	13,440 €	
Marketing budget	427 €		<i>Short term loan</i>		
Website	997 €		Supplier fees	8,902 €	
Revenue	0 €		Total liabilities	22,342 €	
Total cash equivalent	15,597 €				
Total	24,499 €		Total	24,499 €	

DEBIT			CREDIT		
POST	Amount	Unit	Post	Amount	Unit
Fixed assets			Equity		
Inventory	0 €			2,430 €	
Total	0 €		Liabilities		
Current assets			<i>Long term loan</i>		
Bank	14,173 €		Loan mold	12,740 €	
Marketing budget	0 €		<i>Short term loan</i>		
Website	997 €		Supplier fees	8,902 €	
Revenue	8,902 €		Total liabilities	21,642 €	
Total cash equivalent	24,072 €				
Total	24,072 €		Total	24,072 €	

Figure 20 Balance sheets second fiscal year.

4.5.3 Year 2022

DEBIT			CREDIT		
Post	Amount	Unit	Post	Amount	Unit
Fixed assets			Equity		
Inventory (1500 sets)	10,682 €			2,430 €	
Total	10,682 €		Liabilities		
Current assets			<i>Long term loan</i>		
Bank	13,745 €		Loan mold	12,740 €	
Marketing budget	427 €		<i>Short term loan</i>		
Website	997 €		Supplier fees	10,682 €	
Revenue	0 €		Total liabilities	23,422 €	
Total cash equivalent	15,170 €				
Total	25,852 €		Total	25,852 €	

DEBIT			CREDIT		
POST	Amount	Unit	Post	Amount	Unit
Fixed assets			Equity		
Inventory	0 €			2,982 €	
Total	0 €		Liabilities		
Current assets			<i>Long term loan</i>		
Bank	13,745 €		Loan mold	11,760 €	
Marketing budget	0 €		<i>Short term loan</i>		
Website	997 €		Supplier fees	10,682 €	
Revenue	10,682 €		Total liabilities	22,442 €	
Total cash equivalent	25,425 €				
Total	25,425 €		Total	25,425 €	

Figure 21 Balance sheets third fiscal year.

4.6 RATIOS

The current ratio is a liquidity ratio which shows whether CoE BBE has sufficient resources to meet their short-term liabilities. A healthy current ratio has a value higher than 1. This is the case for all points across three years. However, because not all costs are incorporated in the cost price of the bauble but also do not exceed the payment of the mold, the equity of the entity will increase whilst its current ratio will decrease with a growth of 250 sets per year. In other words, marketing costs = €427, but the payment of the mold = €980 in the first year, increasing the company's equity whilst still decreasing the bank budget. This, and the balance sheets, show that the entity will require a financing contribution shortly after the three-year mark (related to buying stock) (53).

Current ratio					
3/12/2020	31/12/2020	1/11/2021	31/12/2021	1/11/2022	31/12/2022
2.25	3.19	1.75	2.70	1.42	2.38

Figure 22 Current ratio

The quick ratio is another type of liquidity ratio which determines the ability of CoE BBE to use its cash to pay-off short-term liabilities instantly. As can be seen, the quick ratio, similar to the current ratio, will decrease over time. This is due to the high price of inventory which must come from the bank. The quick and current ratios are the same as there is no stock of goods at the end of the year. As the values are the same, the previous analysis applies to both (53).

Quick ratio					
3/12/2020	31/12/2020	1/11/2021	31/12/2021	1/11/2022	31/12/2022
2.25	3.19	1.75	2.70	1.42	2.38

Figure 23 Quick ratio

The net working capital shows the available liquidity for an entity. The net working capital at the start of the production period is lower compared to the end due to value of inventory stock. Over the years, available liquidity will decrease due to the primary cash flows (marketing budget out, liabilities decreased due to paying off the mold). As mentioned previously, this also shows that the entity, following the current business plan, will require financing shortly after the 3 years, assuming growth 250 sets per year (53).

Net working capital					
12-03-20	31/12/2020	11-01-21	31/12/2021	11-01-22	31/12/2022
8.903	15.597	6.695	15.170	4.487	14.742

Figure 24 Net working capital

The debt ratio indicated the quantity of assets that are provided through a debt. The debt ratio of CoE BBE is healthy for all three years. The debt ratio is improving as the liabilities are slowly being paid off and the pay-off of liabilities is greater than the expected annual marketing costs (53).

Debt ratio					
3/12/2020	31/12/2020	1/11/2021	31/12/2021	1/11/2022	31/12/2022
0.913	0.905	0.912	0.899	0.906	0.883

Figure 25 Debt ratio

4.7 LIQUIDITY BUDGET

The liquidity budget shows how, and which cash flows change throughout the three years. It is an elaboration of the balance sheets and also shows the decrease in liquidity at the start of each production phase. The liquidity budget includes the following main points; Sales, Cost of sales, Rental charges, Marketing, Balance, Mutation and Balance ending. The sales refer to the expected income streams derived from selling inventory. This number is zero at the start of each fiscal year and the value of the inventory at the end of each fiscal year, because it is presumed all inventory will be sold and paid prior to the start of each new fiscal year. An income statement was not produced due to this assumption (costs = inventory (sold) -> sales).

The cost of sales and rental charges are both components of the total cost of sales to produce the inventory of that fiscal year. The inventory was based off of 1000 sets with an increase of 250 sets per increment. This estimation was based off of communication with the client. The marketing costs are the only externalized costs in this business case. This means that they are not incorporated in the total cost of sales of the product and the product selling price. As can be deduced from the mutation, this slowly decreases the availability of cash equivalents (see balance sheets) over time.

	1000 sets		1250 sets		1500 sets	
	Oct 1st, 2020	Sept 30th, 2021	Oct 1st, 2021	Sept 30th 2022	Oct 1st 2022	Sept 30th 2023
Revenues						
Sales	0 €	7,122 €	0 €	8,902 €	0 €	10,682 €
	0 €	7,122 €	0 €	8,902 €	0 €	10,682 €
Expenses						
Cost of sales	6,522 €	0 €	6,372 €	0 €	8,002 €	0 €
Rental charges	600 €	0 €	750 €	0 €	900 €	€
Marketing	0 €	427 €	0 €	427 €	0 €	427 €
Total expenses	7,122 €	427 €	7,122 €	427 €	8,902 €	427 €
Balance	23,146 €	16,024 €	22,719 €	15,597 €	24,072 €	15,170 €
Mutation	-7,122 €	6,694 €	-7,122 €	8,475 €	-8,902 €	10,255 €
Balance ending	16,024 €	22,719 €	15,597 €	24,072 €	15,170 €	25,425 €

4.8 EVALUATION OF FINANCIAL STATUS

This sub-chapter includes a brief evaluation of the financial status of this scenario. The evaluation is based on the expected turnover, costs and sales over the assessed three years. The liquidity budget, ratios and balance sheets show the following important factors;

- Due to the external marketing costs, the free liquidity of the business decreases over time.
- Due to the fact that the business must pay suppliers prior to selling the product, the cost of producing inventory will, at some point, require additional financing.
 - This is because with increasing demand, inventory increases. Increased inventory means more costs related to resources, production, labor, etc. that must be paid up front.
- Expected turnover related to the seasonality of the product and the expected short production time (November, December) is high.
 - This means that any issues related to paying for cost of sales will become visible prior to the production phase of that fiscal year.

As the scenario was assessed at this time, the 'entity' would lose money over time with an increasing risk of financing requirement over time. After the three-year mark, the total sales would equal roughly; €27000, - with a total estimated cost of roughly; €28000, - (derived from balance sheets).

As an example; the inventory value at the end of the third year equals roughly €11000, - at 1500 sets. If the entity wishes to pursue, for example, a fiscal year with 2250 sets, the cost of sales would equal roughly €16000, -. At this point, the total cash equivalents would not be sufficient in supplying the entity with inventory for that fiscal year.

This loss can be buffered with the initial cash equivalents but does imply that the current assessed scenario does not produce a viable business case over time. Future growth in sets, financing requirement, costs, cash flows, turnover, etc. of the product are unknown and are unavailable to be used for an assessment of the financial viability in the future.

5 ENVIRONMENTAL

One component of the introduction of biobased Christmas baubles, is the elaboration and evidence of the biobased aspects of the baubles. This chapter focuses on EU classification of biobased products, the used polymers and pine needles and an environmentally based chains assessment.

5.1 EU-LABELS

The EU has several different labels specifically for biobased products. There are two main categories: multi-issue labels and single-issue labels. International Organization of Standardization (ISO) differentiates between Type I, II and III, multi-issue ecolabels. Type I labels are based on life cycle considerations, Type II labels are self-declared and Type III labels do not set thresholds/claim environmental preferability (54). Information on resources is included in Appendix X.

5.1.1 Sustainable feedstocks

Single-issue labels focus on one out of three categories: sustainable feedstocks, biobased content and end-of-life options. Sustainable feedstock labels, such as RSB (Roundtable on Sustainable Biomaterials), focus on the use of renewables as resources. Their requirements for biobased products (Category Ib) are touched upon in Table 4 (54) (55) (56).

Table 4 Description requirements of the RSB on sustainable feedstocks (56).

Requirement	Description
Minimum biobased content	The operator shall ensure that the biobased content of the certified product is not less than 25%.
Fluctuations of biobased content over time	In this case, the content as required previously must be met at any time.
Determination of biobased content	Must be done using one of the following options: <ul style="list-style-type: none"> - Through C₁₄ measurements acc to EN16640, ASTM D6866, CE/TS 16137:2011 or ISO 16620-1:2015. - Radiocarbon analysis and elemental analysis acc to EN 16785-1 or ISO 16620-4. - Material balance method acc to EN 16785-2.

5.1.2 Biobased content

Biobased content refers to the biobased quantity of ‘new’ or recent organic carbon in the product compared to the quantity of ‘old’ organic carbon. A tree, for example, is 100% biobased, whilst some milk cartons (90% biobased paper coated in 10% petroleum-based coating) are 90% biobased. The ASTM D6866 method is used to determine the organic carbon content of a solid, liquid, or gaseous sample using radiocarbon analysis by comparing different isotopes of carbon (54) (57) (58).

Some labels that could be considered for the Christmas baubles are: OK biobased (Vincotte), DIN, and 100% biobased. OK biobased indicates the percentage of renewable raw materials or biobased feedstock. The label works using four levels, each indicated using stars. One star is awarded at %20 to 40% renewable feedstock, two stars for %40 to 60%, 3 stars for 60% to 80% and four stars for products containing over 80% renewable feedstocks (59) (60).

DIN is an independent third party where you can document the use of raw materials. In doing so, you show willingness to provide information on your product. Products are required to contain at least 20% organic content, excluding medical, toxic or fuel products. Testing can be minimized by certificating part of the product. DIN also makes use of categories (20%-50%, 50%-85% and >85% biobased content). If the product is compostable, it may also receive a compostability mark. Each

certification is valid for six years and can be extended through monitoring, testing and assessments. Testing methods: ASTM D6866 method, DIN SPEC 91236 (CEN/TS 16137), ISO 16620, DIN EN 16785-1.

Both DIN and Vincotte are also able to provide a 100% biobased certification. This is only given to products with a 100% biobased test results. For the Christmas baubles, this means that any additives (dyes, scents, etc.) must be biobased (61) (62).

5.1.3 End-of-life

End-of-life options for biobased products include several different categories such as compostability, biodegradability in sea water, biodegradability in soil, etc. The three most frequently used end-of-life labels in Europe are 'OK compost', 'DIN Geprüft', and the 'Seedling'. All of these are in line with European compostability norm EN 13432, summarized in Table 5 (54) (63).

Table 5 Requirements EN 13432 for biodegradable products (63).

Requirement	Description
Disintegration	The package sample is mixed with organic waste and maintained under composting conditions for 12 weeks. After this, no more than 10% of material fragments are allowed to be larger than 2mm.
Biodegradability	Measure of metabolic, microbial conversion under composting conditions. Within a maximum of 6 months, the test samples biodegradation must generate a quantity of carbon dioxide at least 90% of that of the control material.
Composting process	Absence of any negative effects.
Heavy metals	Low levels of heavy metals and no adverse effects on the quality of compost produced (specific limits mentioned for each metal).
Compost	The composted product may not have adverse effects on; pH, salinity, bulk density, volatile solids, total magnesium, potassium, ammonium, nitrogen, phosphorus and ammonium nitrogen characteristics.

Some of the potential labels for the Christmas baubles regarding end-of-life scenarios are: The seedling, DIN industrial compostable, and OK compost (Vincotte). They are split up into different categories: industrial compostability, home compostability, biodegradability in soil, biodegradability in sea water.

5.1.3.1 Industrial compostability

The seedling focuses on the biodegradability of a product. To obtain this certification, the product must be at least 90% biodegradable within 6 months. Residues must be suitable for composting. Seedling labels are often combined with OK compost labels. The seedling is managed by European Bioplastics and controls are executed by DIN certo and Vincotte (64).

DIN geprüft industrial compostable certifies biodegradable products according to EN 13432 (Table 5) and other European standards (if applicable). Industrial composting is not applicable for Bio-PE. A general summary of the process of obtaining a DIN certification is as follow (65)s:

- Chemical characterization (identify heavy metals and other toxic substances).
- Check for complete biodegradability.
- Disintegration under practice-relevant composting conditions + quality definition of the resulting compost.
- Infrared spectrum for the identification of the material.

OK compost industrial ensures the product does not have toxic substances and can be degraded in industrial installations. Testing includes: disintegration, ecology and metal testing (66).

5.1.4 Labels applied

The other label categories (home compostability, biodegradability in soil, and biodegradability in sea water) are not applicable to the used biopolymers.

The specific type of PLA used in this project (PLA LX175) has a biobased content certification of 100% and a biobased carbon content of 100% according to EN16785-1 (certificate number DIC-00001). It has been certified 100% biobased according to ASTM D6866 (67).

PLA LX175 is also in compliance with EN-13432 standard and has been certified compostable by TUV Austria (OK compost S478 (industrial compostability)) and by Seedling 7W2030 up to a thickness of 3.5mm. It is the responsibility of the manufacturer to ensure compliance with regulations (67).

The specific type of Bio-PE (HDPE SHA 7260) has a 94% biobased content certification according to ASTM D6866. It is a non-compostable bioplastic, which means it does not suit industrial or home composting (68).

Solanyl C1201 is certified according to EN13432 (industrial composting) OK compost and is certified according to OK biobased (Vincotte) with a class 3 star (60% to 80% (69)).

5.2 MULTI CRITERIA ANALYSIS

Based on the evaluations of the resourcing and end-of-life scenarios for the different options, two MCA's were made evaluating the environmental aspects of each option (Table 6, Table 7). The weighting of each category is the same as an overview was requested by the client. The MCA includes the comparison of PLA, bio-pe, bio-pe with miscanthus, solanyl, glass (with silver), polystyrene and wooden ornaments. The chain assessment conducted to form these MCA results can be found in Appendix X.

5.2.1 MCA resourcing

The resourcing MCA focused on three categories, sourcing, efficiency and waste streams. Sourcing refers to the proximity of resourcing the products. For PLA and bio-pe this is usually from Brazil but can also be produced using sugar beets from the Netherlands. As the capacity in Brazil is larger, and there wasn't much use in debating resourcing, Brazil was assumed.

For bio-pe with fibers, the miscanthus can be derived from the Netherlands. Solanyl can be produced using waste streams from Dutch agriculture. For the wooden ornaments, it is presumed that they originate from sustainably managed forests (70) (71) (72) (73) (74).

The traditional glass baubles are generally produced using silver resources from either Mexico, Peru, China, Russia or Chili. The other bauble type, polystyrene, consists of styrene. Styrene is a derivative of ethylene (produced from natural gas) and benzene (from coal or petrol) (75) (76) (77).

Efficiency refers to the efficiency of the production process. For 'new' biopolymers, this is often considerably less than for drop-in's or long existing petrol-based processes. Because of this, PLA and solanyl scored 'neutral'. As the wood industry has prevailed for decades, the efficiency of processing is also presumed to be large.

Waste streams focuses on any potentially negative or harmful waste streams that are co-produced in the production process. Obviously, all processes have some sort of waste streams. For most products, these waste streams were often able to be re-used or utilized for a different purpose. Polystyrene production was one of the larger producers of toxic waste (78).

Table 6 MCA results resourcing.

Material	Sourcing	Efficiency	Waste streams	Total
PLA	-2	0	0	-2
Bio-pe	-2	+2	0	0
Bio-pe w. Fibers	-1	+1	0	0
Solanyl	+2	0	0	+2
Glass	-2	+2	0	0
Polystyrene	-2	+2	-2	-2
Wood ornament	+2	+2	0	+4

5.2.2 MCA end of life

The end of life MCA focused on products ending up in; residual waste, green waste streams, the environment, and the recyclability of the products.

Products that are thrown out using residual waste streams are incinerated. The slightly higher score for the biopolymers and wooden ornament is due to the fact that they have a short carbon cycle. There was no time to evaluate specific fumes/gases released when incinerating the different products.

The variation in results for the green waste section for both PLA and Solanyl are dependent on the treatment plant they are processed in. One suitable for PLA and Solanyl will result in complete degradation without residues, whilst one unsuitable result in operational failure and contamination of the waste stream.

As bio-pe is a non-compostable and non-biodegradable bioplastic, it will always contaminate and disrupt the process when discarded using green waste streams. The neutral score for the wooden ornaments is due to the uncertainty of its effect on the compost.

PLA is biodegradable under industrial composting circumstances. Bio-PE is not biodegradable or compostable, which is also the case for glass (with the silver layer) and polystyrene. Solanyl is slightly easier for organisms to break down, which is also reflected by it's OK home composting characteristics.

Some types of solanyl are easier for organisms to break down. The specific type used in this project has the same composting classification as PLA. For the ornaments, the used treatment method pentacryl is said to be readily degradable.

Recyclability focused on the ability to re-use the components that the product consists of, as re-using a product is similar for all products. Recyclability for all types of polymers and the wooden ornaments is often questionable, due to degradation in quality over time.

The speed at which degradation in quality occurs was not able to be examined within the time frame. Traditional glass baubles are unable to be recycled, because it is not possible to separate the glass from silver.

Table 7 MCA results end of life.

Material	Residual waste	Green waste	Environment	Recyclability	Total
PLA	+1	-1 +2	-1	0	-1 +2
Bio-pe	+1	-2	-2	0	-3
Bio-pe w. Fibers	+1	-1	-1	0	-1
Solanyl	+1	-1 +2	0	0	0 +3
Glass w. Silver	-2	-2	-2	-1	-7
Polystyrene	-2	-2	-2	0	-6
Wood ornament	+1	0	+1	0	+2

5.3 RECYCLING

Not all households reuse their Christmas ornaments every year. For those that do, there are often still additions or replacements that occur. To stay within the lines of sustainability, the question then becomes, what can CoE BBE, or another entity in the future, do to minimize end of life effects of the baubles?

Some concepts that resulted from the Ghent exchange were using a type of incentive (e.g. deposit) to increase the return rate of the baubles after they are not desired anymore. Upon returning of the baubles, they can be sent to adequate treatment facilities, used for energy generation of the process, or re-used in the process.

As none of the biopolymers are susceptible to at home composting, there is a big chance that they are discarded of improperly due to their biobased labels. Their industrial composting labels mean that they require specific conditions. Even then, their presence in the composting stream is not always desired.

The potential of re-using the baubles poses three significant problems, namely: the bauble types (used polymers) are not easily identifiable, there is a degradation in quality over time, and there is no way to check how often a polymer has passed the production process.

The implementation of a 'service' based business model requires a lot of logistics. It also requires a measurable and profitable gain in executing and maintaining a service-based business model. This system can aid in decreasing end of life effects, but will not eliminate them, as the end of life scenarios just change, so do their effects.

5.4 ENVIRONMENTAL STANDPOINT

The environmental standpoint of the product is an important component to prevent Greenwashing and negative association with the product.

From a qualitative research point of view, the biobased baubles (and other biobased products) aid in the transition from fossil based to more sustainably based products. They add interest to alternatives and help with the development of new biobased and innovative products. Biobased products are generally greenhouse gas neutral due to their short carbon cycle from production to end of life.

A few arguments can be made to argue that biobased products are better than their fossil-equivalents. Looking at the traditional bauble (glass + silver), it makes use of one very scarce component (silver) that has very detrimental effects to the environment (consequences of mining). Biobased products, such as biopolymers, are a growing market that makes use of short carbon cycles, less scarce resources, and can often provide alternatives with the same, or very similar, functionality.

There are also critical side notes such as: required land usage and required fertilizers for production of the biobased resources. Both of these requirements have significant environmental impacts.

There is currently no data available to compare the biobased bauble to competitors or wooden ornaments. An LCA is capable of producing this data. The results of an LCA are often surprising, as products often have hidden impacts (e.g. land usage). Fossil fuel-based products also have a much higher production efficiency.

The results of an LCA can determine whether or not the baubles have a quantitative advantage over competitors when talking about environmental impacts. It is important to highlight the benefits of supporting and developing biobased products in general as the transition from fossil-based products remains necessary and relevant.

6 TECHNICAL

This chapter focuses on technical aspects of the biobased Christmas baubles. This includes: the production process, production capacity and scaling-up aspects. The production process of the biobased baubles is displayed in Figure 26.

6.1 PRODUCTION PROCESS

Before the needles can be combined with the selected biopolymer, they must first be dried (50°C). This process currently takes approximately 8 hours per kilo of tree material. After this, the material is sifted to remove impurities, such as tree branches, old decorations, bugs, etc. This sifting process currently takes approximately one hour for 200 grams of needles. After the pre-processing of the tree material, both the biopolymer provided in small orbs and the dried needles can be used for the next processing steps. Both components, the biopolymer and needles, are combined using a twin-screw extruder at a high temperature (180-210°C). This forms a mixed filament which is then quickly cooled down using water. This filament is then shredded to form granules, which can be used for molding. A contribution of 5 mass percentage of pine needles is assumed throughout the course of this project. Colorants or scents can be applied prior to the shredding phase by adding them to the biopolymer stream. The injection molding process will result in the formation of two halves, which are then to be assembled and packaged.

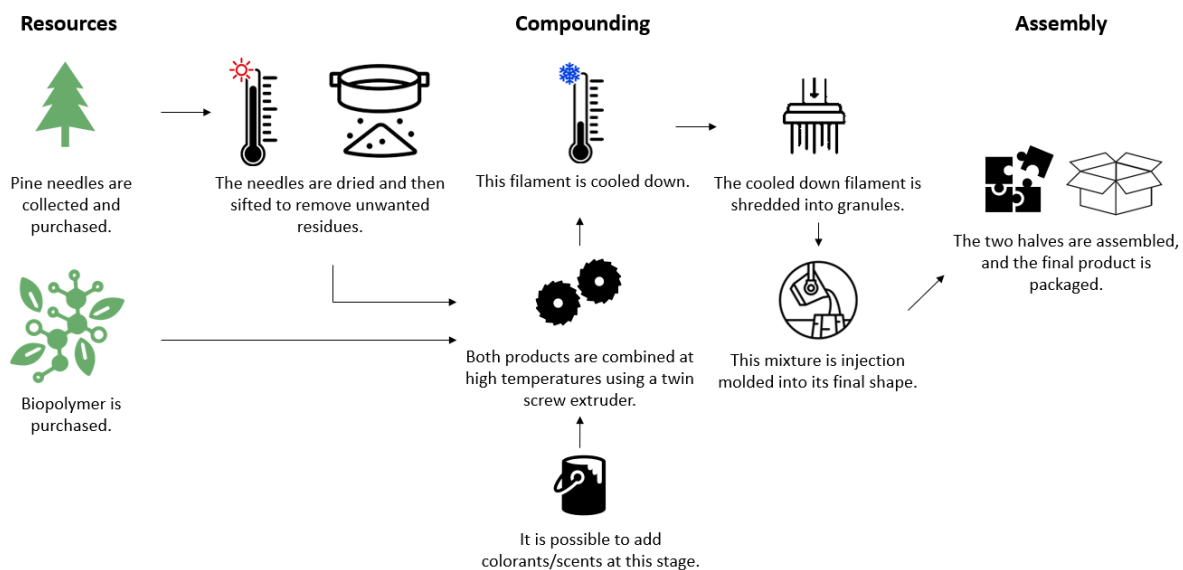


Figure 26 Production process biobased Christmas baubles

Unfortunately, this production process, like any other, produces residual streams. In the case of the Christmas baubles, these residual streams are impurities from the tree material mix, plastic used in flushing of equipment, and residual plastic from molding (2.5 g). All of these streams are currently unutilized and discarded. It is important to note, that the re-use of plastic, thus the re-shredding, drying and re-processing is detrimental to the quality of the plastic and, therefore, the product.

6.2 PRODUCTION CAPACITY (DIFFERENT SCALES)

Currently, the production of the biobased baubles is done on a small test scale. This is due to the fact that the polymers, ratios of biomass to polymer and additives and other aspects such as colors are still under investigation. The production capacity will be estimated using three scales: Avans (testing), BAC

(intermediate) and BATO (industrial). More information on this assessment can be found in Appendix XII. The estimation is based on a Christmas bauble produced with bio-PE and divided up into pre-treatment and production & assembly and packaging. The weight of one of these baubles is assumed to be 42 grams. This number varies and is mainly dependent on the used polymer. The contribution of pine needles to the total Christmas bauble is presumed to be 5 mass percentage, totaling at 2.5 grams per bauble and 10 grams for a set of four (see mass balance section).

6.2.1 Mass balance

Unfortunately, the production process also has losses. These losses influence the total required quantity of biopolymers and needles to produce a Christmas bauble. A mass balance was set up to evaluate the production losses and to quantify the required material before proceeding to a production capacity estimate. For the pine needles, a total mass loss of 15% over the drying and sifting stage was assumed, in discussion with Wilner Acosta. This can be attributed to impurities in the needle mixture, such as old ornaments, branches etc. This would translate to a total required contribution per bauble to go from 2.1g to 2.5g ($2.1/0.85=2.47$).

The next material loss is pre and post process rinsing of equipment. It is presumed that this will roughly equal the weight of the biopolymer in one bauble for each rinsing turn. This would translate to roughly 80 grams of polymer per batch. Per bauble, this would mean a technical material addition required of 0.2 g of biopolymer (2/400 baubles per batch, see pre-treatment assessment).

Another 2.5g of biopolymer is lost per bauble when injection molding. The addition of colorants/scents is neglected due to the fact that it is not expected to interfere with the properties of the bauble and that the mass contribution is expected to be less than 1%w-w. This summed up to a pine needle loss of 0.4g and a polymer loss of 4.505g per bauble. Taking all of this into account, a mass balance was set-up for one Christmas bauble, see Figure 27.

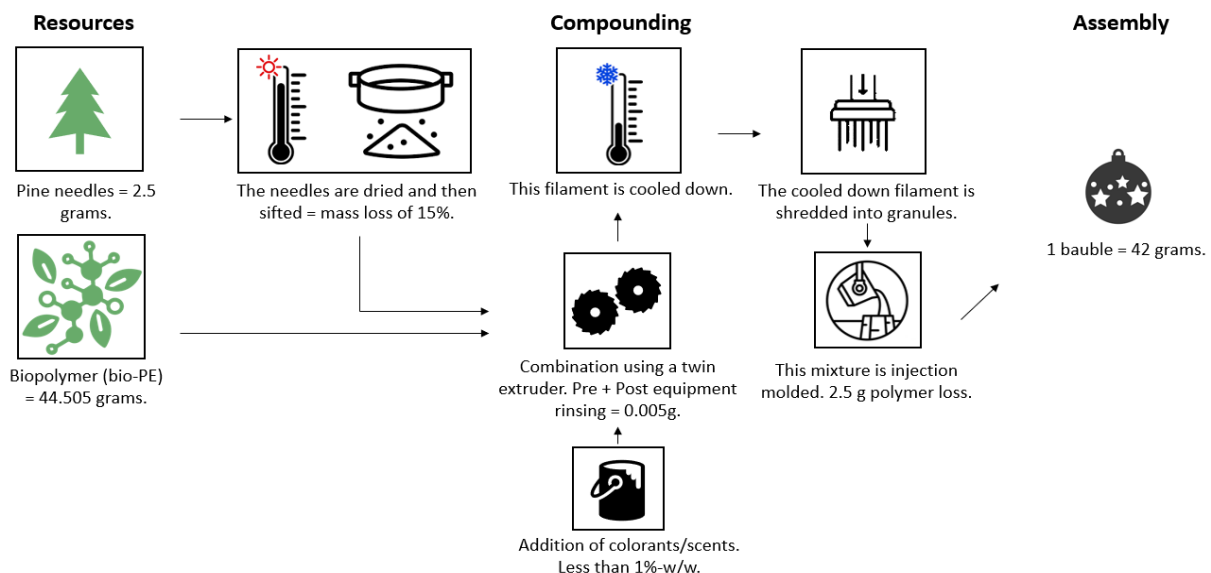


Figure 27 Mass balance Christmas bauble

6.2.2 Large scale production prognoses

The production capacity at industrial scale is naturally expected to be much higher. The process would still consist of batches due to the diversity in colorants and polymers. Large production is likely to occur at BATO, a stakeholder in the project. The production capacity, per timeframe, of BATO is not yet known but anticipated to be substantially larger than that of CoE BBE or BAC. However, it is known that production at BATO will be sufficient for supplying to Avans channels. Currently, the most time-

consuming phases are drying and sifting. Increasing the quantity of one batch or decreasing drying/sifting time will, for now, have the largest impact on production efficiency.

The prognoses in terms of production scenarios are not based on current estimations of sold product in the upcoming three years as production capacity and limitations of these quantities are already known. Much larger quantities were used to provide insights in potential limitations at commercial production status.

6.2.2.1 Production scenarios

To assess the required adaptations for scaling up from BAC to BATO scale, two future production scenarios were set-up and analyzed. Results are summarized in Table 8.

Table 8 Summary production capacity scenario estimate.

Scenario (sets)	Required production rate per set (over 2 months)	Expected limiting process factor
5750	3.3	Molding
9500	2	Molding/pre-treatment

The first scenario consists of the following: *“It is presumed that the introduction through Avans channels went sufficiently well for it to be repeated numerous times. After this, CoE BBE (or another entity) is interested in expanding production to three other schools. To supply sufficiently for this scenario, 15 000 baubles = 3750 sets must be produced from November to December.”*- 1st scenario.

It is also assumed that the ‘normal’ sales figures at Avans have reached and remained steady at 2000 sets = 8000 baubles. For this total production requirement of 23 000 baubles = 5 750 sets, larger quantities of resources will be required.

For the needles (= 2.5 gram per bauble including losses) this sums up to 57 500 grams = 57.5 kilos in total. This might not seem very significant in terms of weight, but its volume is expected to be much larger. For the different polymers (44.505 gram per bauble including losses) this sums up to 1 023 615 grams = 1023.615 kilos in total. Per set, the required resources would be the following: 10 grams of pine needles and 178.02 grams of biopolymers. This would mean that the total quantity of resources that must be processed from November through December are: 57.5 kilos of pine needles and 1024 kilos of biopolymers.

The pre-treatment of the pine needles on BAC scale (if expanded) was estimated to be 8 hours per two kilos at 50°C and 1 hour for 400 grams of sifting. At this scale, pre-treatment processing would require a total of 230 (4*57.5) hours for drying and 144 (57 500/400) hours for sifting. Compounding at BAC scale was 2-2.5 min per set, molding 2 min per set and packaging 2-3 min per set. For the total required quantity this would sum up to 192-240 hours, 192 hours, 192-288 hours.

Using the current estimation for scaled up BAC production, with a production rate of 10 minutes per set, production of the total capacity at BAC scale would take roughly 960 hours (10 * 5750/60). Assuming production days of 8 hours per day, this would take 120 days. This confirms that the optimized BAC scenario is not capable of delivering required quantities. The following calculations serve as an estimate for the ability of supplying the baubles through BATO.

The available timeframe of production is roughly two months = 320 (8*5*8) working hours. This means that the minimum required production time for one set is 3.3 (320/5750*60) minutes. Pre-treatment was reduced to 2.5 minutes. The processing step (extruding, cooling and shredding of the filaments/granules, est. 4-5min and injection molding and assembly est. 4 min) was already presumed to be able to increase its efficiency by twofold by process optimization and was mainly able to be assumed due to the long assembly time. It is not expected to be able to be optimized much further

without scaling up machinery (remains at compounding: 2-2.5 min and molding: 2min per set). Realistically, packaging at industrial scale can be reduced from 2-3 minutes to 1. The total capacity would then sum up to be: $2.5+2-2.5+2+1= 7.5-8$ min per set.

Pre-treatment time might be able to be presumed negligible when occurring simultaneously with production. 8 hours per two kilo and 1 hour for 400 grams of sifting, means that two kilos of needles could be processed within 8 hours, two kilos = 800 (2000/2.5) baubles = 200 sets would still be sufficient to produce for 8 hours, even if production was reduced to 3.3 minutes ($200*3.3/60 = 11$ hours). Neglecting pre-treatment time, production capacity would come down to 5-5.5 minutes per set. As the molding and assembly stage is not expected to change drastically in terms of required time (as required setting time cannot be altered), the compounding phase is the most interesting when looking at optimization of the process. The molding stage currently takes 40 seconds (=roughly 2 minutes per set) and is the quickest phase (meaning it will be the limiting factor when not interested in purchasing a second mold).

The current twin extruder and shredder are lab-scale pieces of equipment. Investments in a larger (or faster) twin extruder and shredder can allow for the compounding phase to reach the time of that of the molding phase, meaning that the process will be able to deliver a bauble roughly every 40 seconds, meaning that the total production capacity would be roughly 3.5 minutes.

“It is presumed that, after the addition of the extra schools, the entity is interested in selling the product through other channels (stores etc.). It is also presumed that this plan is successful, and a larger production capacity is required to meet the needs of both the schools and in-store selling. In store selling requirement is assumed to be an additional 15 000 baubles = 3750 sets.” – 2nd scenario.

On top of the previous selling to several schools, the baubles are now making their way to other channels. This means a total production capacity of $3750 + 5750 = 9500$ sets are required. Assuming the same production window as the previous scenario, this comes down to a required capacity of 2 minutes per set ($320/9500*60$). As the molding and assembly time already takes up roughly 2 minutes per set, it is not feasible to further optimize the process to adapt to the new requirements (based on knowledge of BATO scale, extra investments are necessary).

As mentioned previously, pre-processing is capable for supplying for 11 hours of work at a capacity of 3.3 minutes. For the new capacity, pre-treatment ($200*2/60$) would supply for 6 hours of production. To reach the minimum required 8 hours, we can solve for X, $8 = X * 2 / 60$. This gives us 240 baubles. For the 40 extra sets, an addition of 0.4 kilo of needle capacity in pre-treatment is required.

As the baubles are a batch-based process (due to pre-treatment and different coloring), the scale-up required to meet the new demand might be more beneficial when investing in additional machinery to set up a second twin extruder and injection mold. This would increase production capacity sufficiently and can allow for two different batches to be produced simultaneously.

6.2.3 Resources

The efficiency of the production process is not the only factor involved in scaling up. The resources used to produce the bauble must also remain abundant enough for scaling up. As the market for biobased products and plastic replacements is growing substantially, the availability of the biopolymers is presumed to remain sufficient and is not expected to decrease. On the other hand, the quantity of real trees used each year is expected to decline. Plastic trees are becoming more popular and are slowly replacing the common real trees. The market for real trees is not expected to reduce completely to zero, as it is still adored by many.

7 ADVICE

Based on the findings of the market and customer segmentations a marketing plan was developed for the introduction of Ballsy at Avans university and other universities when upscaling becomes applicable. This chapter summarizes the final advice for each research segmentation touched upon during the execution of this project (marketing, finances, environmental and technical aspects).

7.1 MARKETING ADVICE

First of all, the market position of Ballsy has been reviewed based on macro, meso and micro level. It is important for CoE BBE to review the macro trend analysis on an annual basis to stay up to date with their business strategy and discover new business opportunities. Within the meso environment it can be concluded that The Centre of Expertise Biobased Economy is the only entity introducing biobased Christmas baubles at the moment, which gives them a lot of power on the market. However, the market consists of many indirect competitors that sell normal Christmas baubles such as plastic, glass and wood. The number of indirect competitors make the market positioning of the biobased Christmas baubles fragile as they sell Christmas baubles in many shapes, sizes and colors and attract many customers. Though, it is a great opportunity for CoE BBE to focus on the biobased materials and aspects, as many target segmentations mentioned that they highly value environmentally friendly products and are more likely to consider and purchase biobased products nowadays which will positively influence the client base.

It is advised that the client remains updated regarding product offerings of indirect competition as the market of biobased products is increasing. As CoE BBE's main goal is to increase biobased awareness, the potential introduction of similar biobased products in the future can be considered a success.

To actively market within Avans university in the upcoming years (and other universities when upscaling becomes applicable) it is important for the client to focus on the specific target segmentations. By approaching these target segmentations actively through the mentioned communication channels and platforms of Avans, the website, SEO, email marketing and social media advertising, the segmentations can be targeted actively and independently via owned, earned and paid media. While promoting these media channels it is important to focus on a casual and informal tone of voice and to display a clear style and branding as this creates credibility and trust.

To specify the market positioning of Ballsy it is advised to peruse the strategy of customer intimacy and continually tailor and shape the product based on the customers. To do this, it is vital to implement a customer-first strategy where they become the center of the company, to focus on customer service and to understand the stages that customer go through when buying the biobased Christmas baubles. The more customer focused the strategy for the product, the closer the customers will feel to the brand and increase their loyalty.

At the moment, it is most important to focus on the awareness phase of the customer journey as many customers are not aware of the existence of the product yet. To target the segmentations, it is essential to implement a concentration strategy that focusses on the specific target groups Generation X, Millennials and Generation Z. This will be effective for CoE BBE as they can focus on satisfying the needs of specific target segmentations and can provide a differential advantage over indirect competitors. It is advisable for The Centre of Expertise to take the qualitative research answers concerning the appearance and the colors of the biobased Christmas baubles into consideration in order to anticipate to their needs and increase the market share.

To introduce Ballys effectively it is essential to convey the company’s value of creating biobased awareness among people. The brand story and image must be visible through every communication channel to build a meaningful connection with (potential) customers, establish relationships and brand loyalty. Last but not least, it is advised to implement cause related marketing and involve the charity Rocking up X-mas that helps the organization and individuals in need. This will enhance the reputation of the product and increases the number of potential customers since many respondents mentioned that they are willing to pay more for a product that involves a good cause.

7.2 FINANCIAL ADVICE

The financial situation of CoE BBE was assessed over the course of three years using balance sheets, ratios and a liquidity budget. All three of which showed that the entity, following the current assumed course (+ annual growth of 250 sets), will require additional financing shortly after the three-year period. Based on these results, the following next steps are advised:

- Revise whether internalization of marketing costs is both feasible (change in cost price) and financially attractive.
- Determine whether growth of sets is financially feasible (are these sets being sold).
 - o If growth is desirable, determine new required financing for years to come.
- When wishing to execute the project past year 3 at CoE BBE, continue liquidity budget for upcoming years to determine when financing requirement is applicable.
- When wishing to continue production using an ‘industrial’ or ‘commercial’ scenario:
 - o Determine new cost price based on new information regarding logistics
 - o Determine new profit markup percentage
 - o Re-evaluate investment budget, liquidity, balance sheets and ratios to account for liquidity throughout the years

7.3 ENVIRONMENTAL ADVICE

The applicability for European labels for the used polymers in the baubles project is summarized in Table 9. The bio-PE rating is applicable for both the completely bio-PE based bauble, and the bauble that incorporates miscanthus (the miscanthus bauble might have a slightly higher biobased content but will not alter compostability). Totals from MCA results (based on the chain assessments of the biopolymers and competitor products) of both categories (resourcing and end-of-life) are summarized in Table 10.

Table 9 Summary label applicability project biopolymers.

Applicability	PLA (PLA LX175)	Bio-PE (HDPE SHA 7260)	Solanyl (C1201)
Biobased content	100%	94%	60% to 80%
Industrial composting	Yes	No	Yes
At home composting	No	No	No

Table 10 Summary MCA results biopolymers and competitors.

Results	PLA		Bio-PE	Bio-PE (M)	Solanyl		Glass	Polystyrene	Wood ornament
Resourcing	-2		0	0	+2		0	-2	+4
End of life	-1	+2	-3	-1	0	+3	-7	-6	+2
Total	-3	0	-3	-1	+2	+5	-7	-8	+6

From a label point of view, the inclusion of the bio-PE (and bio-PE with miscanthus) baubles might not be the best choice, as it is limiting in the applicability of composting labels. This advice is assuming that the usage of labels is desirable from either a marketing or principal point of view.

From an environmental point of view (resourcing and end of life), solanyl and PLA are very similar. However, the biobased baubles do not have a measurable advantage over wooden ornaments. Bio-PE, as a drop in of polyethylene, is not biodegradable or compostable. It also originates from sugar cane (mainly from Brazil, like PLA). The lack of biodegradability or compostability makes bio-PE (and bio-PE with miscanthus) the least environmentally friendly bauble when it comes to discarding of the product. For the sake of environmental credibility, it might be wiser to exclude the bio-PE baubles from the product range. This advice is presuming that the goal of raising biobased awareness does not exceed the more specific environmental effect of different biopolymers. Based on the results of the quantitative research, it seemed that most customers do not see the added value of a quality mark or EU-label. It is advised refrain from applying EU-labels, since meeting the requirements could be expensive for a small company such as CoE BBE. If the company starts with upscaling and the budget increases, they could re-evaluate when shown they provide commercial advantage.

7.3.1 Marketing prospects

Products must be careful in their classification of environmental labels such as biobased, sustainable, compostable etc. to prevent greenwashing. All the baubles comply with legislative requirements for biobased products. However, it is one bridge too far to claim that the product is more sustainable or environmentally friendly compared to competitors. Marketing of Bally should be mindful regarding the mentioning of environmental phrases outside of biobased as there is currently no evidence to support that the biobased baubles are more beneficial to the environment due to their biobased concept, or are less harmful at their end-of-life due to some having (partly) compostable traits. For this, extra research is recommended in the form of an LCA to quantify the differences between the biobased baubles and competitors.

7.4 TECHNICAL ADVICE

Based on the findings of the technical assessment, a small summary of future prospects and advice was set-up and summarized in this sub-chapter. CoE BBE is not focused on profit or financial growth. However, the project may be continued by stakeholders within this project. The scaling-up assessment discussed for BATO focuses on required optimization and provided us with an idea of the potential production capacity. BATO is expected to already have machinery related to filament formation, cooling and shredding (related to their current product line). For any future stakeholder interested in overtaking the project, the following important points were summarized:

- Ideally, the injection mold is the limiting factor of the production process (as required setting time is unlikely to change). In this case, it's important to assess the production capacity based on the molding time.
 - o Evaluate extending production time instead of investing in larger/more equipment, what is more financially appealing?
 - o Evaluate whether investing in multiple molds would be very beneficial (expanded product range, simultaneous set production).
- The current product includes 4 types of biopolymers and several colors in one set, this can be an important limiter for production capacity/speed (more batches). It's important to assess the influence of the batch-based process on capacity and whether this influence is relevant.

The two resources used in this project (biopolymers and pine needles) differ in expected price alterations and availability. The biopolymers are not expected to change drastically in terms of pricing as they touch upon a large-scale market. The pine needles are a very specific residual stream, giving significant power to the supplier. It is important to maintain a good relationship with the pine needles supplier. The availability of the needles is unpredictable, review potential 'back-up' streams.

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I Appendix: DESTEP-analysis

This appendix includes a more elaborated view on the DESTEP analysis.

Demographic

Especially in the time of rapid world population growth and overall demographic changes, understanding people is critical to companies. The reason for this is mainly because changing demographics cause changing markets, which means a need for adjusted marketing strategies (5). One of these critical demographic changes that must be considered is the population composition. The Netherlands counts about 17,3 million residents and the number of residents will continuously grow in the upcoming years, but the pace of growth will slow down compared to previous years. This will lead to a higher number of elderlies in the future and hazing and aging of the society. Because of this, the customer demand changes, and specific target groups must be approached to have a higher impact in the market (6).

Economic

Economic factors directly affect the consumer purchasing power and spending patterns (5). According to calculations of the CBS The Netherlands, the gross domestic product fell by 8.5 percent in the second quarter of 2020 compared to one quarter earlier. This decrease can be attributed to the sharp fall in household consumptions, as there is a decrease of 11.4 percent in their spending behavior. Because of the COVID-19 crisis, there has been an unprecedented decline in most industries as they had to close for a period of time (7). The growth of unemployment is damaging the economy, but assuming that the unemployment rate will be back on the structural level before the crisis within five years, means that buying power will increase relatively. The main reason for this is that COVID-19 is not triggered because of an underlying cause of related to the economy (8).

Socio-cultural

The socio-cultural forces link to factors that affect society's basic values, preferences and behavior (5). The average educational level of the population continues to increase in The Netherlands and the population without an education or with a low education, which are more often elderly people is decreasing. The completion of university education will increase from approximately more than 20% in 2040 (79). Because of this, more people have an increasing change of a better job and salary, which changes their preferences and behavior spending in the near future.

Technological

The technological factors are developments and innovations an organization must respond to in order to keep up with the future as new technologies create new market opportunities (80). One of the great technological inventions is artificial intelligence as this technique affects more aspects of our daily life, both at work and in private. Understanding how to make use of these technological developments in the near future can give you an important advantage over the competitors (81). AI is functional intelligence outside the human brain and focusses on the development of software that can reason independently and solve problems that can play an important role in easing the workload at your business (82). According to research and consultancy bureau Gartner, the most strategic technology trend of 2020 is hyper automation. This hyper automation helps with all kinds of tasks within a company that once required human hands and will be replaced by algorithms at a rapid pace that will ensure effective storage and processing of important data (83).

Ecological

Natural forces in the macro environment are important as environmental concerns have been growing strongly in recent years, which makes the ecological force a crucial factor to consider and become aware of as a company (5). The climate is increasingly changing in The Netherlands and research shows that average temperatures will rise in the upcoming decades, which will have major consequences for The Netherlands.

In the upcoming years, environmental measures will become an important point of attention. The predicted climate change will not only have effects on the environment but on the safety of the country as it affects the water level (9). As the ecological forces will have a negative influence on the country, it is important to align the business strategy with environmental concerns and collaborate to contribute positively towards the environment.

Political

The political environment will influence and restrict businesses and individuals in the society and thus affect decisions in the production or marketing of the product (5). Sustainability is not only included in environmental, but also political components. The Dutch government has many ambitions in the field of sustainability.

Rules are drawn up for the reduction of energy, the reduction of natural gas and there will be a switch to alternative energy sources (10). The government will work together with different parties in order to stimulate sustainability within residents and corporations. The business community is an important partner for the national government when working toward a CO₂ neutral energy supply and encourages companies to invest in sustainable energy and a sustainable environment by providing subsidies to businesses that invest in a better and sustainable future (11).

II Appendix: BMC Explanation

This appendix includes information on the BMC model and how it was applied.

Value Propositions

The value proposition is the fundamental concept of the exchange between business and the customer. It should be a part of the overall marketing strategy. For Ballsy, the value proposition consists of two points: generating more biobased awareness amongst people and creating biobased Christmas baubles for a more sustainable Christmas. Christmas is a reoccurring event which results in a lot of waste as a result of temporary decorations and trees. With the biobased Christmas baubles, CoE BBE wants to show people what is possible with recycled Christmas materials.

Customer segments

During this project, the focus is on Avans students and employees. The average age of the target group varies from 16 to 56. Because of this, the target group consists of multiple target segments: generation X (born between 1961 and 1980), millennials (born between 1985 and 2000) and millenials (born between 2000 and 2015). Research on these target groups was conducted. The value proposition is targeted at these three customer segments.

Key partners

Key partners are external companies, suppliers and parties that are needed to achieve the key activities and deliver value to the customer segments (14). A stakeholder's analysis has been conducted in which the partners are categorized. The partners required to achieve the key activities and deliver value to the customer are: CoE BBE, Den Ouden Groep Recycling, Moulds and More, Rodenburg Biopolymers, Biopolymer Application Centrum, Bato Plastics, Avans university and the Avans Communication department.

Channels

Channels are defined through which the customer comes into contact with the business and becomes a part of the sales cycle (14). Because the customer segments are Avans related, Avans channels will be used to reach the target group. Avans has multiple platforms and useful channels which can be used, such as their Facebook page (22K followers) or Instagram account (7,5K followers). On Avans locations there are many TV screens which could be utilized. Another interesting channel is the magazine Punt. Punt is an independent Avans magazine posting online Avans-related news articles daily. The different channels are already often being used for similar projects. CoE BBE is currently also working on a website for the biobased Christmas baubles.

Customer relationships

Customer relationships have a big impact on the customer experience. Depending on the target segment, the type of relationship could vary (84). In this case however, the customer relationships will mostly be the same for all target segments. There are multiple categories of customer relationships, such as: personal assistance, self-service and co-creation. The goal is to have a personal and long-term customer relationship with the customer and their values. Also, a lot of online contact will take place through the online communication platforms. On-site communication at the university will also be a form of contact.

Key resources

The key resources are the practical resources required to achieve the key activities of the business. This means the resources the business requires to do business (14). The following key resources are required: biopolymers, pine needles, packaging, mold, production machine, employees, workspace, marketing channels and finally knowledge on biobased production and materials.

Key activities

The key activities of the business and products is the action that the business undertakes to achieve the value proposition for the potential customers (14). In this case, the activities are all based on producing and selling the biobased Christmas baubles. One of the key activities are the distribution of the biobased materials. The other activities are the production, marketing and sales of the Christmas baubles.

Cost structure

The cost structure is defined as the monetary cost of operating a business. In this cost structure information on the costs for the key activities, key resources, key partnerships, product price and additional costs such as marketing need to be acquired (14). The cost structure needs to be defined so the following resources can be afforded: production materials, logistics and distribution, producing and packaging, storage space and marketing materials.

Revenue streams

The revenue stream is the methodology that a company follows to get its customer segments to buy the product. The main revenue stream that will be used in this market is the usage fee where the company charges the customer for the use of the product (13), in this case the use of the biobased Christmas baubles. Another important revenue stream is the governmental funding CoE BBE receives for this project from the TKI-BBE.

III Appendix: Stakeholder relations map

Many stakeholders are connected within the production of the biobased Christmas baubles. To make clear which stakeholders are connected to who, a stakeholder relations map has been created, which is shown below.

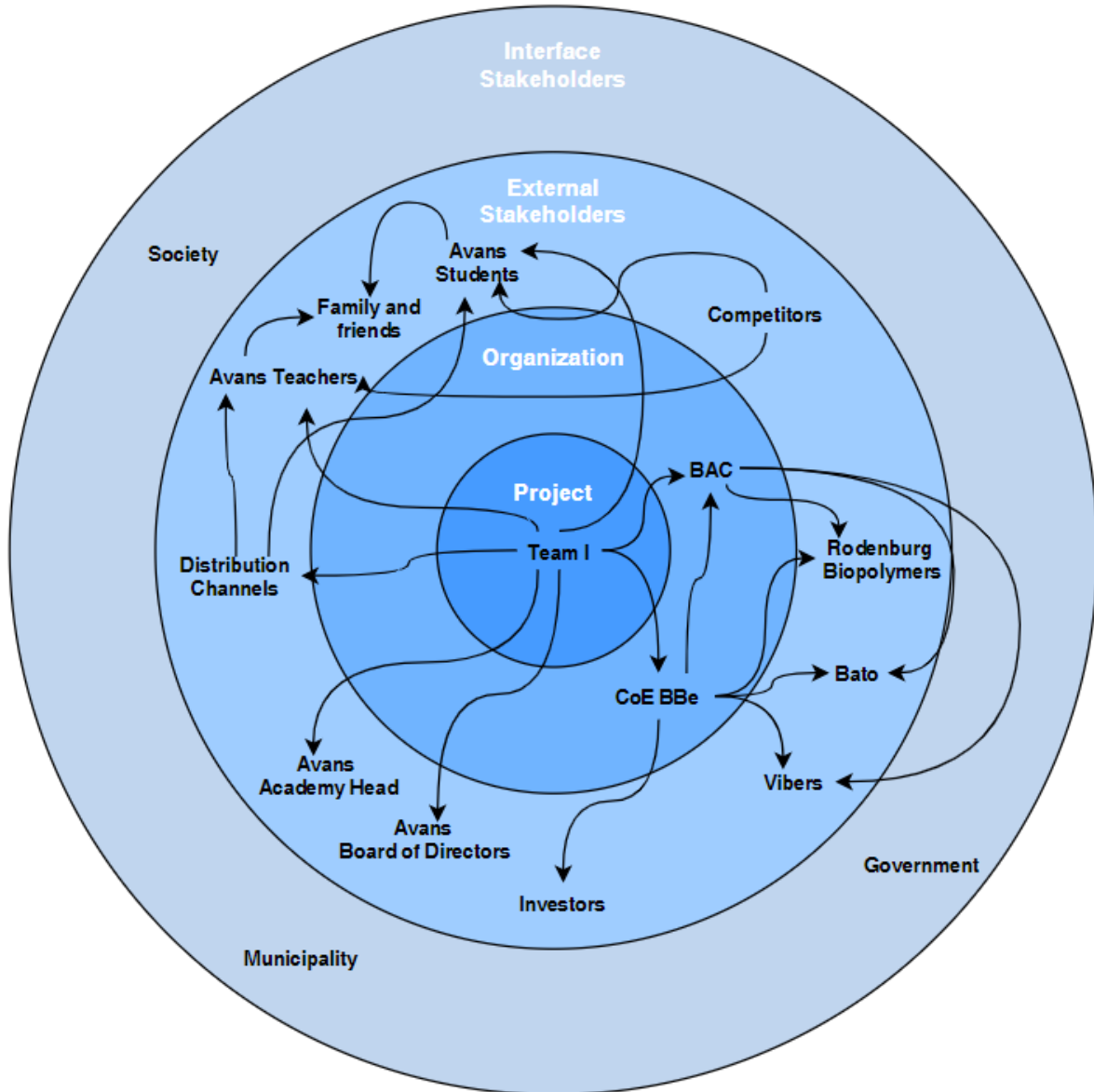


Figure 28 Stakeholder relations map

IV Appendix: Desk research lifestyle segmentations

Research on the typical characteristics of the generations has been done and the results of their main and most important characteristics is explained below.

Generation X

This generation has been born after the 60s, during the reconstruction after World war II. Their life has thus not been easy from the beginning, since, after a long period of upheaval, finding jobs was one of the greatest challenges. Working and producing products and services has been one of their main purposes in life with no room for idealism as they have been financially hurt the most (85). Moreover, they might feel lost between two huge generations because of the rise of personal computing. Individualism, ambition and addition to work are some of the values that they grew up with (86).

Millennials

A revolution has been shaped by this generation. They are also known as digital natives and technology has become a part of their everyday lives. Most of their activities are mediated by screen and migrated to the digital world, which we are living in now. Unlike other generations, the world requires higher job standard because of the economic crisis. Unlike most of their parents, such as Generation X, these digital natives are not satisfied with everything around them, are ambitious and want to achieve their goals (40).

Generation Z

This post millennial generation will take the lead in a few decades. This group has been marked by the internet and has become part of their DNA as it storms into their homes, their way of education and socializing. Their mastery of technologies may make them neglect their interpersonal relationships to a greater extent but will also give more voice to social causes on the internet. They like to get everything that they want immediately as they are immersed into the digital world. Moreover, Generation Z are multitaskers but have a limited attention span and are independent but demanding consumers (40).

Interest of the lifestyle segment

Interests of the different lifestyle segments will be shown in order to understand what really matters to them so the company and the product can connect on to them a deeper level.

Generation X

Gen Xers are spending more than their counter parts. Despite studies showing that they continue to struggle with debt and finances such as their savings for retirement, they are well positioned to become one of the wealthiest generations, above baby boomers within the next few years (87). One of the main interests for Gen X is that they enjoy learning the new technology of the century. Moreover, they love spending time with their family and like to have a feeling of independence (88).

Millennials

Understanding the interests of the Millennials is crucial to a successful business as this is the largest target segmentation. Millennials have the greatest purchasing power of any generation. It is therefore important to discover their major interests. Firstly, Millennials want to experience something genuine, incredible and build long lasting memories. They care more about the experiences and not the status of spending a fortune.

Secondly, they care about values of others such as mental health, bullying and issues on politics. They want to push for change and encourage others to join them. Thirdly, Millennials are interested in the problems in the world, such as climate change, animal extinction and discrimination. They want to get involved and find purpose in their life. Another important aspect is their interest in eco-friendliness. Sustainability is quickly becoming a deciding factor when it comes to shopping. Most Millennials do

not want to buy from brands that are harmful to the planet and they are shifting towards a zero-waste lifestyle. On top of this Millennials are very interested in keeping up with their connections in entirely different ways as they are interested and integrated in the latest technologies (89).

Generation Z

This generation is an extreme change from the Millennials and will have a huge interest in technical materials as they are tech-savvy and mobile-first. They have high standards on how to spend their time online and are becoming tech dependent (90). Moreover, they have a large interest in experiencing new adventures and not just purchasing items. They are obsessed with brands that are authentic (91). Just as Millennials, Generation Z is more aware of the environment and sustainability and want to contribute to a better world.

Results quantitative research

Quantitative research has been done to find out whether the target segmentations know what sustainability means as well as biobased technology in order to know whether they are really interested in this aspect. The results from the survey show that almost everyone knows what sustainability means, also almost all the respondents understand the meaning of biobased. The same respondents mention that the environment is important in daily life. Nevertheless, not everyone is doing something for the environment, however 90 percent does. Besides this, the number of respondents who are already using biobased products in daily life is higher than suspected, as this is 70 percent of all respondents. They agree on the fact that biobased products influence the environment positively, but do not yet have the knowledge on negative environmental aspects and events such as Christmas.

Besides the environmental aspect, interests related to Christmas have been researched as well. Questions asked regarding this aspect are about the use of the Christmas ornaments and the reuse of this. Almost everyone still uses the Christmas baubles and around 87 percent of them do reuse the ornaments every year.

Values

This topic will discuss the most valuable factors for the different target segmentations. These values will influence people's behavior and their buying behavior.

Generation X

This generation grew up with minimal adult supervision and thus learned the value of independence and a work-life balance. They are technologically adapted, flexible and highly educated. They value independence since they have accustomed to care for themselves, value freedom, responsibility and try to overcome challenges of their own. Moreover, they value a healthy balance between time spent at work and personal time and want to pursue their own aspirations. Generation X adapts well to change and value an informal environment. They have a work hard, play hard mentality and appreciate humor and diversity (92).

Millennials

While Millennials are socially more liberal than other generations, their values are traditional. In general, Millennials are more flexible, adaptive and open to change compared to Generation X, who value more tradition in the sense of stability, hard work and security. They also have higher moral values as they value friendship, love, and ambition and their lives outside work (93). Besides their friendships, Millennials value family and a personal connection with them. They are optimistic and believe in the possibilities of change and advocate for the environment and social justice (94).

Generation Z

Because of Generation Z's social life, media consumption and education are dependent on the internet and mobile computing devices, it does not come as a surprise that Generation Z greatly values connectivity and free access to information. This group depends largely on technology and social media for their interactions with the outside world. Even though they spend a lot of time on social media platforms it does not mean that this generation only values technology. Generation Z is a generation that has been raised to believe that they should value what makes them unique and they adapt to their generation's norm by embracing what makes them different from the other generations. They seek out creative ways to express their individuality.

Moreover, this is the first generation that grows up with mainstream media representations of modern life but also in the middle of a worldwide concern about climate change and cares about limiting their environmental impact (95). They are heavily involved in ethical shopping and embracing second-hand products. On top of that, Generation Z cares about the collective good and well-being, but also want everyone to have freedom of expression and support groups that are real and authentic (96).

As Generation Zers are online for most of the time and value privacy. Less than a quarter of the Zers are comfortable with sharing their personal details online aside from their contact information and purchase history, but will share this personal information if they trust the brand and their data protection (97).

Results quantitative research

Based on the results of the quantitative research, more information has become known on whether the target segmentations value Christmas and find this holiday season important. From these results it became known that 82 percent of the respondents value the Christmas season and 92 percent of the respondents celebrate this holiday season every year.

Buying behavior

It is necessary to find out what the target segmentations find important while considering their purchases and for a company to research the buying behavior to adapt their marketing strategy to it, such as the brand and channels. The different buying behaviors per target segmentation are described below.

Generation X

While many company's focus on the younger generations, older generations, such as X are still of major importance as they have more buying power. These generation prefers well-established shopping channels like instore but are also trying newer options because of technological developments. Around 82% of the Xers like to buy their products instore at least monthly and are more likely to do research on the specific product before they buy anything. They do not only like to buy products instore as nearly one out of three report shopping via the computer frequently, although they do not prefer to use mobile devices for this.

Generation X are more likely to stay loyal to a brand that is already known because of previous purchases (98). Generation Xers want companies to deliver straightforward messaging about why they need to buy the product and a fast check-out experience is important for their purchase decision.

Generation X are value hunters and are focused on getting value for their money and product quality. They prioritize products that are reliable, fairly priced and budget friendly (99). This is mainly because they were a part of the great recession and they do not think that they can rely on social security and are save for many things (100).

Moreover Generation X are savers, they are actively hunting for deals online and are most likely of any generation to use coupons or promotion codes found on the internet or on social media platforms such as Facebook (101).

Millennials

This generation approaches shopping quite differently compared to the older generations. First of all, Millennials want their purchases to make them feel good and tend to gravitate towards purchases that are an expression of their personality. Unlike Generation Xers that value their money more, Millennials value products that meet both logistic and emotional needs. They prefer to spend their money on experiences rather than material thing and are willing to pay extra for this. They are more likely to share their purchases on social media compared to Generation Xers.

They prefer to try new and innovative brands rather than turning to an old and reliable brand. Their brand value is low and therefore it is important that companies move away from winning the customers but instead think about how to impress them over and over. They trust peer generated confirmations and place more value to word of mouth and product reviews (102).

Correspondingly, Millennials consider social responsibility and environmental friendliness when considering their purchases, so companies face significant expectations in terms of shopping and buying behavior and it is important to invest in these needs (103).

Generation Z

The youngest generation has been growing up with the internet, so online shopping does not take much effort. About 60 percent of Generation Z shoppers will not use apps or website that load slowly or are difficult to navigate (104). They are very comfortable with technology and constantly want to stay connected, shop online, participate online and gather information online. Due to their greater access to large volumes of information on the internet, they heavily revolve around their social media responsibility, are more aware of modern-day challenges such as climate change and terrorism and want to see a positive change in this as well. They expect brands and retailers to have similar beliefs and will not spend money on those that do not.

Generation Z is constantly multitasking and want brand advertising to be transparent and value simplicity. Moreover, they are more focused on purchasing with the intent to be happy than any other generation. Spending money is a big driver for their happiness, so they tend to have a higher spending power than older generation. They heavily lean on brands that help them to craft their identities and are willing to purchase an item that gives them a certain image, which is partly due to the growing up on social media in the public eye and the pressures to constantly look and feel the best (105).

Generation Z's approach to brands is part of what sets them differently from Millennials. When deciding where to shop, their primary motive is price. Generation Z is not loyal to any brand or store but shop anyplace that is most affordable, and where personal values can be found. Gen Z was quite young when the financial crisis begun, they were old enough to remember it and see how their parents and older friends struggled. They are highly informed and want to take charge of their lives and futures. Being unique and balancing that with saving money is a defining trait of this generation. Generation Z will support and participate in brands that they believe in and that reflect on them (106).

Every generation relates to brands differently, but they have some of the same objectives when it comes to the shopping and buying experience of a product. Despite their differences, every generation finds payment security, easy brand interactions and transparent promotions the most important factors whenever choosing where to shop. And no matter which generation will be mainly targeted, great customer service is always the most important (99).

Results quantitative research

While conducting quantitative research, information on the buying behavior of the target segmentations has been retrieved as well. Results show that 81% of the respondents spending behavior during Christmas is between 50 and 150 euros and 19% of the respondents mention that they spend between 150 and 300 and no one prefers to pay more. 12% of the respondents prefer to buy new Christmas baubles every year and 40% of the respondents even buy a new Christmas tree every year. The other 60 percent prefers to stick to a plastic tree.

What is important to find out about the buying behavior of the target segmentations is whether people would like to pay more for a biobased product and what price they would like to pay. Results show that 74% of the respondents are willing to pay more for a biobased product, such as the biobased Christmas baubles. Almost 49% of the respondents would like to pay between 0 and 5 euros for a set of four Christmas baubles and 43% is willing to pay between 5 and 10 euros, besides this 9% is even willing to pay 10 or more euros for a set of 4 biobased Christmas baubles.

Additionally, the respondents were asked whether they would like to pay more for a biobased Christmas bauble when there is charity involved and results show that 87% of the respondents would be willing to do so. Results showed that 79% of respondents would prefer to have a biobased Christmas bauble that is a bit more expensive compared to a normal Christmas bauble that will be cheaper. 21% of the respondents mention that they choose not to spend more on a biobased Christmas bauble.

Media channels

Research on the use of specific media channels by each target segmentation has been done in order to find out how to reach the target group in the best possible way. Of course, this differs for every generation and it is important to find out which different marketing channels are needed to adapt to the right marketing strategy and attract potential customers.

Generation X

Generation Xers are busy as they are dealing with children, finances, work and a lot more. They are adapting themselves to technological developments and can be found online more and more, specifically on social media platforms such as Facebook and Twitter. This generation is a true hybrid when it comes to marketing. They grew up without the online shopping experiences, so they still enjoy a trip in-store but also fully embraced the online shopping possibilities. Although email marketing seems to be old news, it is still the best way to communicate with Generation X as they already use email a lot in their daily life, during work, by communicating with family and therefore natural that they would react positively to retail emails as they are checking email at work, at home, on their phones, tablets and laptops (100).

Every generation is still using Google, and while some brands are focusing on social media advertisements it might be better to continue testing paid search campaigns for Generation X. As Generation X is quite cynical and do not really trust brands immediately it is important to stay true to your brand in order to win them over and have a lifetime of brand loyalty (101).

Millennials

Millennials are reshaping the way that goods and services are being marketed by staying unresponsive to traditional marketing tactics. They decide on their product or service based on Instagram pictures, Facebook posts and recommendations of their friends. Research shows that 68% of the Millennials will not make major decisions until they have discussed it with the people they trust. Review sites have become a huge source of information for businesses such as Yelp and TripAdvisor. It is important to ensure online reviews and customer experiences are up to date.

63% of Millennials would be more likely to check in to a business via social media channels if they receive a coupon or discount such as '20% off' or 'you can experience this with a discount after sharing

with 5 friends on Facebook or Instagram'. Besides this, 77% of Millennials are willing to participate in rewards and loyalty programs and 73% of the smart phone users are interested in using their mobile device to interact with brand loyalty programs. On top of their great social media use, Millennials report listening to the radio around 11 hours per week and radio commercials can attract many potential customers (100). Investing in and using digital marketing as the primary marketing strategy is the way to go. Five out of six Millennials connect with businesses through social media networks and averagely touch his or her phone 45 times a day. The five digital marketing channels most used by Millennials are: Facebook, Instagram, Snapchat, web browsing (thus web advertisements), and twitter (107). Video marketing is a very attractive means of advertising for Millennials as well as they use video platforms such as YouTube and TikTok.

Implementing SEO with compelling content can be one of the main drivers to attract the potential customer segmentation. Millennials are doing thorough research before making their purchase decisions and the best way to learn about a product or brand is to search for it. Being on top of SEO results is crucial when reaching out to Millennials (108).

Generation Z

As Generation Z consists of multitaskers, there is only a limited time (of a few seconds) to convince them to respond to your ad or post. Writing with visual elements is an attracting factor. It is not surprising that Gen Z like is spending most of their time on Instagram, Snapchat and YouTube with Facebook coming in at fourth (109). Compared to older generations, Generation Z are twice as likely to shop mobile and mobile devices such as smartphones and tablets need to be a focal point for a brand's digital front for optimal engagement (110). Omnichannel marketing is a key strategy to reach Generation Z as they want brand experiences among all channels. They differ from the older generations as online videos on Instagram, YouTube and TikTok are a key brand discovery platform behind social media and websites and specifically reflect the product or services that they are interested in.

They tend to favor brands that demonstrate their commitment to working on the society's best interest as this generation is twice as likely as to care more about issues of equality and the environment compared to older generations (111). Research has shown that most of the Gen Zers are aware of the importance of reviews in order to build brand trust. They want brands to respond to feedback and view this responsiveness as key to determining the authenticity of the brand. Moreover, this generation reads at least 5 online reviews on average before making a purchase (97).

V Appendix: Competitor analysis

In this Appendix, the different competitors of the biobased Christmas baubles will be discussed to find out what the position of the company and the product is (112). This competitor analysis has been conducted and finalized in October of 2020.

Just like other companies, The Centre of Expertise Biobased Economy will have competition when introducing the product. When speaking about competition, this can be subdivided into direct and indirect competition. Research has been conducted to figure out how the biobased Christmas baubles can be best introduced and on how to attract the target group in order to gain more potential customers compared to their competitors.

Direct competitors are businesses that offer essentially the same product, so biobased Christmas baubles. Indirect competitors are companies that offer products which are not exactly the same, but could satisfy the same needs, such as normal Christmas baubles (113).

Selection procedure

The direct and indirect competition is selected by means of research on the web. By searching for terms such as 'Kerstballen Breda', 'Duurzame kerstballen', 'Biobased Kerstballen Breda', 'Biobased Kerstballen', 'Biobased Kerst' 'Kerst winkel Breda' and 'Kerst spullen Breda'. Out of this analysis a selection of companies will be made. This selection will not only be based on the companies that sell and produce Christmas baubles and biobased Christmas baubles but as you can see there will also be a focus on companies mainly in Breda.

Direct competition

Unfortunately, no direct competitors have been found that sell biobased Christmas baubles using the selection procedure. This information is important for CoE BBE, as it can be concluded that they are the only one introducing biobased Christmas baubles at the moment. When searching for direct competitors, wooden Christmas baubles were considered too as they can be marketed as biobased, but since it cannot be guaranteed that these wooden Christmas baubles were made from biobased materials only, they have been categorized at indirect competition as well.

Indirect competition

For the indirect competition, research was conducted focusing on Christmas shops, who sell Christmas balls in Breda. Based on the available results, a selection of the 5 best known Christmas shops selling Christmas balls has been made.

Background information on the competition

This sub-chapter includes background information about the indirect competition of CoE BBE.

Intratuin Breda

Intratuin is a franchise retail chain of Intratuin Holding with 53 garden centers in the Netherlands, 3 in Belgium and 10 in Germany (114). The company was founded in 1983 and is the market leader in the Netherlands and the largest in the Benelux (115). One of the 53 garden centers are situated in Breda outside of the city center. They offer more than a traditional garden center as they offer new inspiration, tips and trends for your home, garden, patio and animal, appropriate for the season. Something for everyone (116). Besides their normal range of products throughout the year they offer a large Christmas assortment that offers everything that is needed during the holiday season from Christmas ornaments to Christmas trees, Christmas lights, and, of course, Christmas baubles (117).

Marijn Kroese Bloem & Plant by Dennis Kuijlaars

Marijn Kroese Bloem & Plant is a flower, plant and home decoration store in the city center of Breda. They have been producing flowers for over 40 years. 28 years ago, the owner, Dennis Kuijlaars, opened his own shop which quickly grew into a thriving company (118). Besides the home decorations that they offer during all seasons, they also offer quite an assortment on Christmas ornaments, such as houses, balls, candles and figurines.

Tuincentrum GroenRijk Schalk Prinsenbeek Breda

GroenRijk Schalk in Prinsenbeek Breda is a garden center with enthusiastic and skilled employees. This garden center has been founded 40 years ago in the center of Prinsenbeek and has a complete and well taken care of assortment with plants, flowers home decorations, garden tools and, most importantly, Christmas decorations in winter season (119).

Søstrene Grene

Søstrene Grene is a well-known retail business all over the world which offers exciting products with an attractive design and in an abundance of colors, shapes and scents, also in the city center of Breda. It is their goal is to offer good and relevant products and to give a unique shopping experience at every shop. Products are often without packaging to ensure that customers have the ability to touch them and, more importantly the ability to save on packaging costs and environmental impact (120).

Blokker

Blokker is a Dutch chain of household goods stores in the Netherlands. This company started in 1986 and has been founded by Jacob Blokker. It has roughly 430 stores in the Netherlands (121). Multiple of those stores are situated in Breda, just outside the city center of Breda with a total of 5 that are well known among many residents (122). Blokker offers an extensive range of other products nowadays, among which, Christmas decorations.

Products

This portion of the competitor analysis focuses on the specific products provided by the competitors.

Intratuin Breda

Besides their normal range of services, they offer Christmas products including Christmas trees, Christmas lightning, Christmas garlands, Christmas ornaments, Christmas pendants, Christmas villages, Christmas figures and a wide range of Christmas balls. In total, Intratuin offers 791 Christmas balls in their assortment. These Christmas balls can be bought in every color and style such as old, vintage, modern and sturdy. Moreover, there is a choice between 24 different colors and 7 kind of materials such as glass, wood, concrete, plastic, lather, paper and felt. They also range from different kinds of shapes such as round, star, drop, triangle, cone and sphere (123).

Marijn Kroese Bloem & Plant by Dennis Kuijlaars

Marijn Kroese Bloem and Plant offers a lot of Christmas decorations. These Christmas decorations range from Christmas ornaments, to Christmas lights and houses. Moreover, they also sell Christmas balls in many colors and shapes, which can be seen via pictures on the website. The exact number of Christmas balls cannot be researched nor the exact number of colors and shapes, since their Christmas assortment is only for sale in the shop (124).

Tuincentrum GroenRijk Schalk Prinsenbeek Breda

From the 3rd of October, GroenRijk will be transformed into a true Christmas show full of beautifully decorated Christmas trees for inspiration and the best creations of Christmas pieces such as a beautiful Christmas village. Moreover, you can visit their store for modern Christmas decorations, but for classic and traditional ones as well. You can find Christmas trees, lightning, decorations, wreaths, houses and

above all Christmas balls (125). These Christmas balls will be available in different colors and a diversity of shapes and styles. Information about the exact number of Christmas balls available for sale and the number of colors, shapes and styles will unfortunately only be available in store (126).

Søstrene Grene

Søstrene Grene offers a total of 60 Christmas products at their store. These Christmas products consist of Do It Yourself projects of which you can actually download templates in order to become creative at home. With every Do It Yourself project a template should be downloaded and the corresponding materials can be bought at Søstrene Grene (127). In total, there are 11 Christmas ball Do It Yourself projects available at Søstrene Grene such as 'Fold your own Christmas ball' (128). The exact shapes and colors can be dependent on the customers preferences, as they can 'Do It Themselves'.

Blokker

At Blokker they offer a wide range of Christmas decorations, with a total of 8496 products which range from Christmas trees to Christmas lightnings to Christmas garlands, sweaters and Christmas balls (129). Blokker offers a total of 2524 Christmas balls and sets, where you can choose between 18 different colors and 16 different materials, such as plastic, glass, metal, wood, paper, polyester and more (130).

Price

This portion of the competitor analysis focuses on the pricing of the baubles.

Intratuin Breda

At Intratuin, the price of Christmas balls ranges from 0.69 for a 1-piece Christmas ball to 12.99 for a 1-piece Christmas ball (131). Besides this, Christmas sets with 4 Christmas balls in it have been researched as well, since the Biobased Christmas ball will be sold as a set of 4. The cheapest Christmas set of 4 balls at Intratuin is 0.69 euros and the most expensive is 13.99 euros (132).

Marijn Kroese Bloem & Plant by Dennis Kuijlaars

Unfortunately, prices are not obtainable at the moment, since the Christmas assortment is not yet available for sale online.

Tuincentrum GroenRijk Schalk Prinsenbeek Breda

Unfortunately, prices are not obtainable at the moment, since the Christmas assortment is not yet available for sale online.

Søstrene Grene

Sadly, no prices are available at the moment at Søstrene Grene, as they only have 'Do It Yourself' Christmas balls. For this 'Do It Yourself Christmas' balls a template can be downloaded, and additional materials have to be bought at the store itself, with different price ranges. Besides 'Do It Yourself' Christmas balls, Søstrene Grene has no other Christmas products online and therefore no price can be determined.

Blokker

The prices at Blokker are hard to determine, since the Christmas balls vary from a 1 piece to a 100 Christmas balls sets. On average, 1 Christmas ball costs 1.99 euros at Blokker. The average price for Christmas balls at Blokker per 4 pieces is averagely 10.50 euros (133).

Promotion

This portion focuses on the used promotion by competitors. Specific results per competitor have been included in the appendices.

Website

For a comparison of the websites, a website analysis has been conducted. Every point written is an outstanding point on the website of the competitor. The two most important components in the website analysis are the layout and the technical aspects. As most of the websites have a large assortment of products besides the Christmas balls they offer, the content of the competitors is less important to keep in mind for the implementation of the Christmas baubles online. Additionally, the biobased Christmas baubles will not be sold on the website itself but only information about the biobased Christmas baubles will be available, so the content is not comparable.

By taking the positive layout points and the technical aspects into account, potential customers may become attracted to the future developed website of the Christmas baubles. Moreover, there are some points colored in red. These points are negative aspects that came forward on that particular website. It is important these points are considered as well, while making a future website of the Christmas baubles in order to avoid potential customers from leaving the web page.

Intratuin		
Content	Layout	Technical aspects
Assortiment	Modern	Adjustable for mobile phones
Inspiration	Clear	High speed
Gifts	Colors of the logo are visible through the whole site	Click through pictograms for social media such as Facebook, Youtube, Instagram and Pinterest
Shops	Easy to understand	Sign in for newsletter
Folders	Photo advertisements on the front page	Diverse payment options
Workshops	Subheadings to for easier search	Create own account
Sale	High quality pictures	Search button
Customer service		
Log in/Sign up		
About Intratuin		

Marijn Kroese Bloem & Plant By Dennis Kuijlaars		
Content	Layout	Technical aspects
Home	Modern	Adjustable for mobile phones
Assortiment	Clear	High speed
Funeral bouquets	Colors of the logo are visible through the whole site	Contact form
Care tips	Easy to understand	Diverse payment options
Contact	Photo advertisements on the front page	Create own account
Log in/sign up	Subheadings to for easier search	Search bottom
Openings hours	Products available on front page, to shop fast	
	Low quality of pictures	

GroenRijk Schalk Prinsenbeek		
Content	Layout	Technical aspects
Webshop	Modern	Adjustable for mobile phones
Sale	Crowded, too much going on on the front page	High speed
Folder	Colors of the logo are visible through the whole site	Contact form

Assortment	Easy to understand	Click through pictograms for social media such as Facebook, Instagram and Pinterest
Delivery	Photo advertisements on the front page	Sign in for newsletter
News	Sub headings to for easier search	Diverse payment options
Greentips	Products available on front page, to shop fast	Search button
Customer card	High quality pictures	
Contact		
Reviews		
Partners		

Søstrene Grene		
Content	Layout	Technical aspects
Products	Modern	Adjustable for mobile phones
Inspiration	Clear	High speed
DIY-projects	Colors of the logo are visible through the whole site	Contact form
Find a store	Easy to understand	Click through pictograms for social media such as Facebook, Youtube, Instagram, LinkedIn and Pinterest
About us	Photo advertisements on the front page	Website available in multiple languages
Contact	New products on the front page	Search button
Customer service	Products available on front page to shop fast	Frequent asked questions
	High quality pictures	

Blokker		
Content	Layout	Technical aspects
All categories	Modern	Adjustable for mobile phones
Inspiration	Crowded, too much going on on the front page	High speed
Returnpackages	Colors of the logo are visible through the whole site	Contact form
#blokker	Easy to understand	Click through pictograms for social media such as Facebook, Instagram and Pinterest
Customer service	Photo advertisements on the front page	Sign in for newsletter
About Blokker	Subheadings to for easier search	Diverse payment options
Log in/Sign up	Products available on front page, to shop fast	Search button
	Sale items on the front page	
	High quality pictures	

Social media programs

Within the social media analysis, the available social media websites per competitor have been reviewed, such as Facebook, Instagram and, for some of the competitors, even YouTube and Pinterest. For all the social media accounts the regularity of posts have been included. To compare the Facebook pages of the different competitors, aspects such as the number of likes, the number of followers, the time limit in which they respond, the click through link to the web shop and other technical aspects have been considered.

For YouTube, the number of subscribers, the average amount of video views and the link to the web shop has been included. Concerning Instagram, the number of posts and followers, the link to the web shop and the use of technical aspects such as Instagram stories and highlights have been studied. For Pinterest, the range of Pinterest boards, the number of followers and the link to the web shop has

been determined. By analyzing the different social media approaches of the competitors, it can be seen that the majority of the competitors have an active approach in online promotion and the online promotion of their products. It is thus important that the social media platforms of the competitors are considered in order to make the future potential social media platforms for the Christmas baubles at least as attractive and useful as the social media platforms of the competitors.

Intratuin			
Facebook	Youtube	Instagram	Pinterest
Post regulary	Post regularly	Post regularly	Post on Pinterest boards regularly
130994 likes	275.000 subscribers	934 posts	Wide range of Pinterest boards
128.698 followers	Over 500 views per video	Uses Instagram highlights	20.272 followers
Answer within 1 day	Link to the webshop	Uses Instagram stories	Link to the webshop
Link to the webshop		119.000 followers	
Shop via Facebook		Link to the webshop	
Search stores via Facebook			

Marijn Kroese Bloem & Plant By Dennis Kuijlaars	
Facebook	Instagram
Post regulary	Not active on Instagram
637 likes	5 posts in total
654 followers	15 followers
Answer within 1 hour	Contact details available
Link to webshop	

GroenRijk Schalk Prinsenbeek		
Facebook	Instagram	Pinterest
Post regulary	Post regulary	Post on Pinterest boards regularly
2.734 likes	1.197 posts	Wide range of Pinterest boards
3.006 followers	Uses Instagram highlights	28 followers
Answer within 1 hour	Uses Instagram stories	Link to the webshop
Link to the webshop	1.377 followers	
Reviews	Link to the webshop	

Søstrene Grene			
Facebook	Youtube	Instagram	Pinterest
Post regulary	Post regularly	Post regulary	Post on Pinterest boards regularly
2.282.309 likes	631.000 subscribers	2.297 posts	Wide range of Pinterest boards
2.286.818 followers	Over 500 views per video	Uses Instagram highlights	81.150 followers
Answer within 1 day		Uses Instagram stories	Link to the webshop
Link to the webshop		Uses IGTV	
Search stores via Facebook		1.4 million followers	
Events		Link to webshop	

Blokker		
Facebook	Instagram	Pinterest
Post regulary	Post regulary	Post on Pinterest boards regularly
226.138 likes	964 posts	Wide range of Pinterest boards
218.854 followers	Uses Instagram highlights	1.757 followers
Answer within a few hours	Uses Instagram stories	Link to the webshop
Link to the webshop	38.800 followers	
Search stores via Facebook	Link to the webshop	
Events		

VI Appendix: Quantitative research answers

This appendix includes the results of the survey. The results of every respondent can be seen in the graphs below. The number behind the answer shows the quantity of people that chose that answer.

Question 1: Do you study at Avans?

- No (26)
- Yes (86)

With this question we wanted to check which percentage are students. 76 percent are students.

Question 2: Are u an employee at Avans?

- No (88)
- Yes (23)

With this question we wanted to check which percentage are employees. 24 percent are employees.

Question 4: Do you find Christmas important?

- No (20)
- Yes (93)

In the graphic you see that most of the people still attach value to Christmas. 82 percent thinks that Christmas is important.

Question 5: are you celebrating Christmas every year?

- No (9)
- Yes (104)

It looks like almost everyone is celebrating Christmas every year. Only eight percent doesn't.

Question 6: are you using Christmas ornaments/balls during Christmas?

- No (9)
- Yes (103)

It looks like the same results as in previous question, as expected.

Question 7: Do you reuse the Christmas ornaments every year?

- No (13)
- Yes (99)

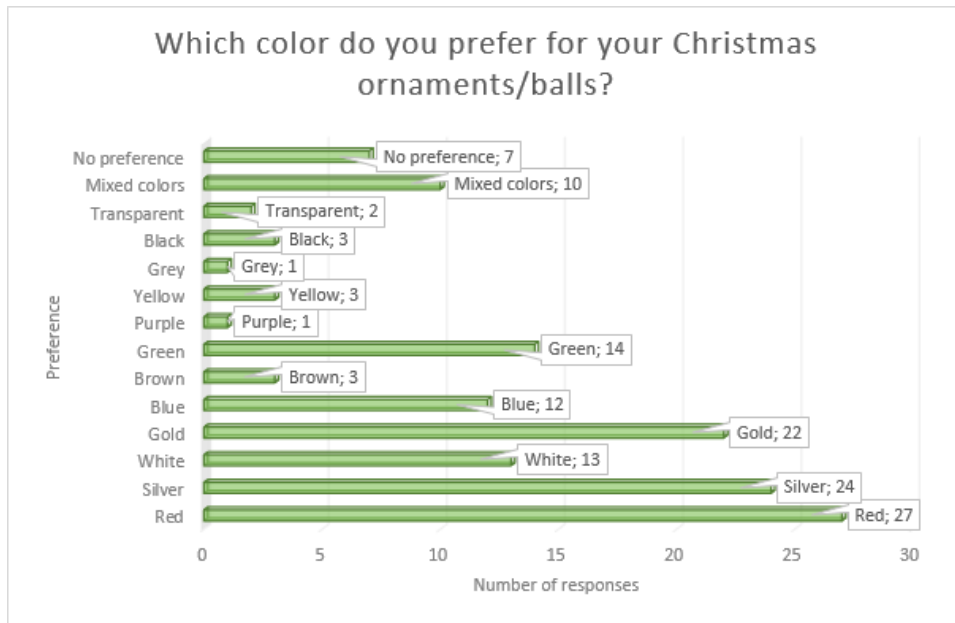
Most of the people don't buy new ornaments every year. Only 12 percent does.

Question 8: do the Christmas ornaments need the same color?

- No (91)
- Yes (20)

82 percent prefer different colors. The other 18 percent prefer the same color.

Question 9: We kept the graphic, because it easily displays the dispersion of answers. The three most successful colors are gold, silver and red. Than less successful but still more attract than the other ones are blue, white and green.



Question 10: Do you know what sustainability means?

- No (2)
- Yes (110)

Here we see that almost everyone knows what sustainability means, except of a few.

Question 11: Do you know what biobased means?

- No (7)
- Yes (106)

Almost everyone knows what biobased means. 94 percent already knew what it means (to them).

Question 12: is the environment important to you in daily life?

- No (6)
- Yes (107)

Only for six out of the 113 replies think that the environment not important.

Question 13: Are you doing something for the environment?

- No (11)
- Yes (102)

A lot of people are doing something for the environment. The other 10 percent is not as interested.

Question 14: are you already using biobased products?

- No (34)
- Yes (79)

70 percent of our target group is already using biobased products. The other 30 percent is not.

Question 15: do you think biobased products can influence the environment positively?

- No (1)
- Yes (112)

Except of one everybody thinks that it has a positive influence on the environment.

Question 16: are you aware of the negative environmental influences that Christmas has?

- No (42)
- Yes (71)

Slightly less than half of our target group wasn't aware of the effects from Christmas on the environment. Still more than the half feels aware.

Question 17: how much do you spend on Christmas average?

- 150-300 euros (20)
- 50-150 euros (88)

The results say that 81 percent is spending in between 50 and 150 euros. The other 19 percent spends between 150 and 300 euros. No one pays more.

Question 18: Are you buying new Christmas products every year?

- No (100)
- Yes (13)

Not that many people are buying new ornaments every year. Only 12 percent does.

Question 19: Do you buy new real Christmas tree every year?

- No (66)
- Yes (46)

41 percent still buy every year a new real Christmas tree. That's almost half the target group.

Question 20: Are you willing to pay more for a biobased Christmas bauble?

- No (29)
- Yes (84)

The majority is willing to pay more for a more environmentally friendly product.

Question 21: how much are you willing to pay more for a biobased Christmas Bauble?

- 10 or more (10)
- 5-10 (48)
- 0-5 (54)

Most of the people want to pay between 0 and 5. Not far behind is the group that wants to pay between 5 and 10. Almost nobody wants to pay more than 10.

Question 22: Are you willing to pay more for the biobased Christmas ball compared to the normal Christmas ball if there is a good cause involved?

- No (14)
- Yes (99)

Most of the people really want to pay more if there is a charity involved. Almost 88 percent is willing to pay more.

Question 23: If you can choose between a Christmas ball that is a bit more expensive but biobased or a Christmas ball that is cheaper but not biobased, which would you choose?

- Normal ball (17)
- Biobased ball (95)

A lot of people want to pay more for biobased Christmas baubles. Only 17 out of 113 don't want to pay more in comparison with 95 out of 113 that really want to pay more.

VII Appendix: Qualitative interview guide

This appendix includes the qualitative interview guides for the qualitative 25 interviews which were conducted by Isabel Spits, Joel Besems, Lucas de Mangelaere and Shanne Mast. For these 25 qualitative interviews, interview guides have been made for the customer journey of Generation X, Millennials and Generation Z. The qualitative research guide and results are delivered in a separate word document as the results are too outsized to insert in the appendix.

VIII Appendix: Qualitative research results

This appendix includes the information retrieved from qualitative 25 interviews which were conducted by Isabel Spits, Joel Besems, Lucas de Mangelaere and Shanne Mast. For these 25 qualitative interviews, 8 participants from Generation X, 9 participants from Millennials and 8 participants from Generation Z were interviewed. In agreement with Arlon Biemans the qualitative research results are summarized per interview and not transcribed and coded as this would have taken a vast amount of time. The qualitative research guide and results are delivered in a separate word document as the results are too outsized to insert in the appendix.

IX Appendix: Possible distribution channels for sale

This appendix includes information regarding potential other channels used to sell to in the future.

HZ university of applied sciences

Our client already has connections with the university of applied sciences. HZ already works together with Avans. Zeeland in itself is already strongly involved with sustainability. This means that there is a good connection between Avans and HZ. They are based in Vlissingen and Middelburg. This university also works on sustainability by searching for innovative solutions. A big part of their university is their stand on sustainability and the environment. HZ green office organizes a weekly cleanup along the beaches and waterways in Zeeland. They work together with organizations as “Doe Mee Verlos de Zee, “Rijkswaterstaat” and “stichting Strandexploitatie Veere”. Beside these organizations they also collaborate with companies and municipalities. These actions are combined with researching the trash and waste they find, including where and how much they find. Other projects on sustainability are about separation and prevention, the “student garden”, carpooling, stimulating bike traffic and electric driving.

Additionally, the students have a share in the sustainability of HZ. Dutch and international students work together with staff and supervisors. In these projects they are focusing on creating a sustainable study, working and living environment. They are doing this under the motto: “act global, think global” (134).

Hogeschool Rotterdam

Hogeschool Rotterdam is working on the world of tomorrow together with their students. They focus on questions such as: “How does the world look like in the future?” and “How sustainable is the world in the near future?”. Their goal is to create a society which will be nice to live in.

To achieve these goals, they have to work on several points. They choose to focus on the energy transition, renovating houses in a sustainable way, but they also focus on the humane part, such as working on increasing study success or fighting against poverty. Next to this they focus on the SDG’s. These Sustainable Development Goals are not only focused on the environmental part of the world or reducing the carbon dioxide, as the ethical part in these 17 goals are very important. The SDG’s are made the by the United Nations and the intention is to reach these by 2030. Hogeschool Rotterdam does not only pay attention and effort to the environment in the courses or in their missions, but also in their activities. For example, for school trips or journeys, they focus on visiting surrounding countries which has been and will be done by environmentally friendly means of transportation, such as by train. Moreover, the university pays a contribution to compensate the CO2 emissions for every flight whenever this is applicable (135).

Utrecht university

The university of Utrecht is working on a better world and future. Next to this main vision, they want to introduce sustainability as core tasks in their education and want to include research about these business operations. During this research they will implement planetary boundaries, which are nine environmentally based boundaries that must be met to live a sustainable life. These boundaries are based on the 17 Sustainable Development Goals. By using the planetary boundaries, they try to reduce their ecological footprint, their carbon dioxide pollution and want to contribute to keep the planet below the two degrees or even below the one and a halve degree (136) (137).

The university is aware of its position in society. Regardless of which field of study you follow, they introduce sustainability and environmental aspects. They introduce research, education and business

operations in their reports. This shows that researchers and students work together to create a more sustainable campus. For the upcoming years they created a new report with the plan to introduce future-proof buildings, energy and emissions, mobility and even catering (138).

Vrije Universiteit Amsterdam (VU)

The “Vrije Universiteit Amsterdam” puts a lot of effort in sustainability and the environment. Sustainabul 2020 shows that the VU is scoring very well as a sustainable university in the Netherlands. Sustainabul is a kind of survey prepared by students every year. The results from the survey turned out in the advance of the “Vrije Universiteit Amsterdam”. Only “Hogeschool Van Hall Larenstein” is doing better. The sustainabul 2020 is the second conformation for them of being sustainable this year. In April they also ended up second out of almost 500 universities in the “Times Higher Education Impact Ranking 2020”. This ranking is based on how much a university contributes to the Sustainable Development Goals (SDG’s). With these high rankings they show that it’s possible to create an environment where there is a balance between people, sustainability and economy, without exhausting the planet. They do that by linking the basic scientific knowledge with the knowledge of introducing the sustainable changes in the society and on the VU campus. Research about sustainability is one of the most important activities they have in their university. Students, teachers and researchers are working together on the theme of “Science for Sustainability” and they try to find solutions for a lot of sustainability issues. Additionally, they are setting up goals for making the VU-campus 100 percent natural gas free in combination with using green energy for 100 percent (139).

Hogeschool Van Hall Larenstein university of applied sciences

The institution is based in Leeuwarden and is also very focused on sustainability. As already mentioned before, “Hogeschool Van Hall Larenstein” ended up first in the Survey of Sustainabul 2020. That means they are the most sustainable higher education in the Netherlands. They want to create a better and more sustainable world with their Network Partners in an enjoyable and productive way. These ambitions are translated in their way of teaching, the applied research and the organization of the institution (140). Next to the recognition of Sustainabul 2020, they also achieved the level “Erkend” with an MVO-audition. (MVO = maatschappelijk verantwoord ondernemen / Socially responsible organization). MVO is a sustainability standard based on the ISO26000, the international standard for socially responsible organization. Hogeschool Van Hall Larenstein is the first “hogeschool” in the Netherlands who has received this certificate (140).

Breda university of applied sciences (BUAS)

Besides Avans, there is another big university in Breda named BUAS which puts effort in trying to be more ecofriendly on their campuses. First of all, they try to create an open, green campus and an ecofriendly environment. They do that by planting trees, plants and creating a place where birds and insects can stay. Next to that, they also try to create a nice environment for working and studying by making place for sports and recreation (141). The university is investing in sustainable transport. Next to research regarding sustainable transport, they also take a look at the economical chances of sustainability. Moreover, the university connects sustainability with the professional practice. In this part of their tasks they also urge to make international choices which are sustainable and socially responsible. Likewise, the university introduces sustainability everywhere on campus in order to create awareness among the students and employees (142) (143).

Wageningen University of Research (WUR)

Sustainability is an important aspect for WUR. Together with 44 partners, the university is working towards a climate neutral Wageningen. Many projects of WUR are related to waste and energy. Each year, WUR measures its climate impact with the CO2 footprint. According to statistics, WUR is the greenest and most sustainable university in the world (144). WUR has a research institute called Food

& Biobased Research. The institute conducts applied research for sustainable innovations in healthy food, fresh food chains and biobased products. The WUR has several different research themes that are similar to the themes of CoE BBE, like creating value from biomass, biobased chemicals and fuels and renewable materials. WUR often cooperates with companies, government authorities and other knowledge institutes (48).

X Appendix: Environmental information resources

One important component of the production of the biobased baubles are biopolymers. Currently, there are four different polymers are up for discussion. These polymers are, Polylactic acid, Solanyl, bio-PE (Bio-polyethylene) and a variant of Bio-PE with Miscanthus fibers.

Polylactic acid (also known as PLA), is one of the most extensively applied and researched biopolymer. PLA has shown great potential in the replacement of petrol-based polymers in the field of industrial and biomedical applications. PLA is a thermoplastic and strong polymer that uses renewables as a resource. The specific properties of PLA are dependent on the used isomers, the production process/conditions and the molar weight. Crystallinity is the most important variable regarding the properties of PLA and can form three different structural positions (α , β and γ) (145). Solanyl also uses renewables as resource, more specifically, reclaimed potato starch. This starch is converted into biopolymers by for example injection molding and thermoforming. It is biodegradable and compostable and is most suitable for short life/disposable products like packaging or cutlery. Solanyl can also be adjusted to last months or sometimes even years, particularly in dry applications (146).

Bio-polyethylene is a biobased polymer that also used renewable feedstock. It is mostly made from sugar cane, a food crop, by using fermentation to produce bioethanol. The bio-ethylene monomer can be used to make different variants of PE. This can be done by using standard polymerization processes (147). One variant of bio-pe that is also included, is the mixing of bio-pe with Miscanthus fibers. Miscanthus grows similarly to cabbage. In its rough form, it can be used as feed for farm animals or as a fuel and this is possible due to the low moisture content and high energy content. When purified, it can serve as building materials, paper, biofuels or bioplastics. Due to the addition of miscanthus fibers, the required quantity of biopolymer decreases (73).

Pine trees

The other important component of the bauble are pine needles which, do not only produce a nice aesthetic, but also reduce the quantity of biopolymer required per bauble. This leads to costs savings for the manufacturer in the end. The needles originate from used Christmas trees and are generally considered a waste stream. This makes them a cheap resource and allows further utilization of the waste stream. Most of the Christmas trees come from Scandinavia or the Ardennes. There are a lot of different Christmas trees available. For many years, the European Spruce (fijnspar for its acronym in Dutch) has been the most sold tree. Other well-known Christmas trees are European Spruce, Nordmann fir, Serbian fir, Blue fir and the Silver fir. In 2017, an estimated 2.5 million Christmas trees were sold in the Netherland. Of these 2.5 million trees, roughly 50 percent originated from the Netherlands. Most of these trees were Silver firs and are produced in Noord-Brabant, Drenthe, Overijssel and Gelderland. The rest of the trees were primarily sourced from Denmark and Germany and were mostly Nordmann firs. Dutch consumers spent roughly 30 to 40 euros on a tree on average (148).

After the holidays, most trees end up in composting, some of them are used as biomass for, for example, energy generation. In a lot of Dutch and Flemish regions all of the collected Christmas trees are burned at the beginning of the new year. The trees are often collected by children and they sometimes get a small reward in return. After collecting, the trees will be burned under the supervision of the fire brigade. Companies such as “Den Ouden”, collect the trees and use them to produce biomass. This biomass can then be used for different purposes, such as biofuels, biofilters and bio building resources. Den Ouden has been specialized in the handling of green waste and are the supplier of the used Christmas trees, thus pine needles to produce the biobased Christmas baubles (149).

XI Appendix: Chain assessment information

The chain assessment focuses on the environmental impact of the product chain compared (resourcing and end of life) to that of competitors. Current polymers used per set are; PLA, Solanyl, bio-PE and a variant of bio-pe with Miscanthus fibers (total set of 4). The production process is elaborated on in the technical chapter. The competitor products are assumed to be produced either using glass with a small layer of silver on the inside or plastic (polystyrene) and wooden ornaments (150).

Resourcing

The first part of the chain assessment focuses on resourcing. This includes: where do the building blocks of the product originate from, does the product compete with other resources (e.g. food), is the product made in an efficient manner, and does the production process produce waste streams which are very detrimental to the environment?

PLA

Poly lactide is made from renewable raw materials such as corn starch or sugar cane, commonly from Brazil. The end of life composting requirements costs more energy than a normal composting process. The lactic acid that comes from corn starch or sugar cane is combined with alcohol to form a volatile liquid. The fumes go through a chemical catalysator to separate the lactic acid and alcohol. Two lactic acid molecules bind together to form one lactide molecule. This produces pure PLA pellets which is a perfect resource for the baubles. There are no toxic byproducts that originate from this production process (70).

Bio-PE

Bio polyethylene is also produced from renewable resources, particularly sugarcane from Brazil. Bio-PE is a “drop-in”, which means that the chemical composition and a large part of the production process is identical to fossil-based polyethylene. Brazil is a large sugarcane producer as the climate near the Amazon allows for the perfect conditions. Unfortunately, this means that, similar to PLA, it requires a lot of transport for utilization in the Netherlands.

Bio-PE is produced using a fermentation process. After fermentation, the sugar has transformed to bio ethanol. Dehydration of the bio ethanol creates ethylene. This ethylene can then be polymerized to produce polyethylene. Because Bio-PE is a drop in, processing of this material is easier than other, newer, bioplastics. Regardless of the required transport, bio-pe still contributes less to overall CO₂ emissions compared to traditional polyethylene (71) (72).

Bio-Pe with Miscanthus

Miscanthus (olifantsgras for its acronym in Dutch), is an abundant grass species in the Netherlands. It's commonly produced in close proximity to airports. This is done to decrease the nuisance caused by birds surrounding the airports as they don't favor Miscanthus for foraging or nesting. The addition of Miscanthus fibers to the polymer, decreases the amount of polymer required. Miscanthus is a non-food crop (73).

Solanyl

Solanyl is made from starch leftovers, such as potato peels and is, therefore, reutilizing waste streams. Most of the used potato peels originate from French fries or chip producers. Other resources for solanyl production can be roots, grains or seeds as long as they are abundant in starch (151). The production process of solanyl uses significantly less energy than that of fossil-based polyethylene. An advantage of solanyl is the reutilization of waste, similarly to the pine needles. This would mean that the entire bauble exists of re-purposed waste streams (74).

Glass (with silver)

Traditional baubles are generally made of glass with a small lining of silver. The resources to produce glass are sand, soda, chalk and dolomite, which are first mixed before beginning the melting process. The melting process occurs at a temperature of 1500 degrees Celsius. The melting portion requires a lot of energy and typically runs on natural gas (152).

After everything is melted, the substance is purified over a couple of hours, after this the glass is floated. This means that the glass is removed from the ovens and placed in a bath of tin. Here, the temperature is reduced from 1100 degrees Celsius to 600 degrees Celsius. The thickness and the shape of the glass is determined in this step (152).

The glass is then coated with metal-oxide to increase the strength. This is also performed at elevated temperatures. After coating, the temperature is gradually reduced. When the glass reaches room temperature, it's ready to be cut (152). The silver on the interior of the bauble is most likely mined in either Mexico, Peru, China, Russia or Chili. Almost 25% of total silver utilized is recycled silver. The mining process of silver is far from ethical. Silver requires high temperatures to melt and it's often treated with corrosive chemical products (75).

It's typically mined using open pit mining. In this process, they dig a shallow bit, with a very large cross-sectional area. This is detrimental to local ecology. After all silver is retrieved, the pits are left as they are. This leads to a puddle, or multiple puddles, of water forming at the bottom of the pit. The reaction between rainwater, leftovers of silver and other metals create a very toxic environment which slowly seeps into the ground water, with great environmental damage as a consequence (153).

Polystyrene

Polystyrene is a thermoplastic polymer made out of the monomer styrene. It is a fossil-based plastic. Thermoplastics are deformable under high temperatures. It is often strengthened using different additives. The specific types of additives depend on the required end product. It is presumed that the specific type of polystyrene used in Christmas bauble production is EPS (expanded polystyrene). In this process, polystyrene is first heated to melt, and then blown into a mold to obtain its final shape. A large advantage of polystyrene baubles is that they do not tend to break easily. The use of polystyrene is controversial, as some studies show expanded polystyrene can be very detrimental to health (76) (77).

Wooden ornaments

There was not a lot of information available regarding the production or resourcing of wooden ornaments. It is assumed that the wood used in their production originates from sustainably managed wood. The production process is assumed to be quite efficient as the wood industry has been established over several decades. A potential coating used in the production of wooden ornaments is pentacryl (154).

End of life

For the end of life scenarios, it is presumed that the baubles are either re-used, discarded using residual waste, includes ending up in the environment or discarded through green waste. The same effects are expected for re-using and giving away of the baubles (except for Solanyl, not possible) and are therefore not further elaborated on. Glass recycling is not included since glass baubles are not recyclable through traditional glass recycling channels. This means that any of the baubles discarded through glass will act as contaminations of the stream.

It is assumed that, because of the biobased definition of the product, it is much more likely to be discarded using green waste channels, which might not necessarily be beneficial. As this is not a

measured comparison, the precise effects of, for example two non-biodegradable plastics in the environment, is neglected as this is too meticulous for the desired comparison.

PLA

PLA has a relatively long half-life of hydrolysis which is due to the alkyl groups. PLA degradation in the environment is challenging because it has a large resistance when it comes to microorganisms in soil or sewage under ambient conditions. It must be hydrolyzed at increased temperatures, roughly 60°C, to reduce the molar weight before biodegradation can occur. At high temperature and high humidity for example, active composting, PLA can degrade quickly and it disintegrates within weeks or months (145) (155).

When PLA is discarded through residual waste streams, it is most likely incinerated for heat and electricity generation. Since PLA is quite popular, there are many LCA analysis available for LCA incineration. A cycle assessment of recycling options for polylactic acid by Daniel Maga found that the incineration of PLA does not contribute more to CO₂-eq emissions during incineration due to carbon capture of the biomass (156).

This is not only due to the fact that PLA is a biobased plastic, but also due to the energy generation from incineration. This energy supply into the grid also saved CO₂-eq emissions for more conventional methods of energy generation which is fossil based (156).

Unfortunately, PLA can also end up in the environment. As mentioned previously, degradation of PLA in the environment is unlikely. Because of this, environmental impacts such as pollution of land and the oceans are still applicable to PLA (157).

According to a study on Biodegradation of Compostable Plastics in Green Yard-Waste Compost Environment, PLA has been shown to compost well in municipal composting facilities and left no harmful residues. However, PLA must end up at a proper industrial composting plant. 'Regular' composting at ambient/slightly elevated temperatures is not successful for PLA (157) (158).

However, this does not mean that every green waste handler is using a process equipped to deal with biodegradable or compostable plastics. If the process is not adapted to also suit, for example PLA, the presence of PLA can cause operational problems, decrease the quality of the final compost, or cause the whole load to be rejected (159). Bioplastics generally do not contribute to the quality of the compost and are, therefore, not desired.

Bio-PE

A very appealing feature of bio-PE is the fact that it is a drop-in replacement for fossil fuel-based PE. This means that the chemical structure, the properties of the polymer and the recycling of the polymer are identical. Unfortunately, this does mean that bio-PE is not biodegradable or compostable (160).

Similar to the addition of the pine needles, the addition of the miscanthus fibers is not expected to alter the behavior of Bio-PE in end of life scenarios. If anything, it slightly decreases the required quantity of biopolymer per bauble, slightly mitigating effect in all waste streams. Miscanthus provides an energetic value, when incinerated, that is equal to that of coal (73).

Due to its biobased concept, bio-PE is expected to produce similar results to PLA when incinerated. Of course, this is also very dependent on the sourcing and production of bio-PE. Because this is a drop-in solution, those processes are expected to be much more sufficient, unlike PLA for example.

Unfortunately, bio-PE can also end up in the environment. Due to its properties consisting of the exact same molecular structure as polyethylene it is not able to biodegrade or compost. This means that bio-PE will also behave like traditional plastic pollution (160).

Since bio-PE is neither compostable nor biodegradable, discarding it in using green waste means that it is considered a pollution of the waste stream. As mentioned previously, the presence of biodegradable or compostable plastics can cause many problems. These problems are related to them potentially not degrading fully/fast enough. No degradation is expected for bio-PE, meaning that the problems such as operational problems, decrease the quality of the final compost, or cause the whole load to be rejected are unpreventable (159) (160).

Solanyl

As mentioned previously, Solanyl is biodegradable and compostable and is most suitable for short life/disposable products like packaging or cutlery. Solanyl can also be adjusted to last months or sometimes even years, particularly in dry applications (146).

Since solanyl is a much less known biopolymer, there is not a vast amount of information available on solanyl and its degradation. Similar to bio-PE and PLA, an incineration process is expected to be beneficial in terms of CO₂-eq emissions. Solanyl is generally certified according to EN13432 which means that its biodegradable under composting circumstances (55-60°C). The biodegradability in the environment (20-30°C) is very diverse. In its pure form, starch, it is easily and quickly degradable. However, the additions of polyesters to obtain the desired properties rapidly decrease the biodegradable speed, increasing the time spent in the environment (161) (74).

Very similar to PLA, the consequences of the presence of this biopolymer in green waste is dependent on the conditions of the waste treatment facility. The same as in the previous case: If the process is not adapted to also suit, for example solanyl, the existence of solanyl can cause operational problems, decrease the quality of the final compost, or cause the whole load to be rejected (159). Bioplastics generally do not contribute to the quality of the compost and are, therefore, not desired.

Glass (with silver)

Traditional Christmas baubles are generally produced using glass with a layer of silver on the inside. These traditional decorations cannot be used for recycling because the glass does not melt properly at the same temperatures as bottles and jars do. This causes lumps and irregularities in the molten material. Therefore, baubles can be a major contaminant and should be disposed of using residual waste (162).

When the baubles are discarded of using this method, they most likely end up at an incineration facility, however, the related CO₂-equivalents are not 'compensated' for as is the case with biobased products. Remaining glass shards can take up to 2 million years to decompose (163) (164).

Due to its very poor biodegradability, the effects of glass in the environment have sometimes even been claimed to be worse than those of plastic. However, recycling rates of glass are much higher and much more efficient. Silver might act as a toxin in both aquatic and terrestrial environments (165) (166).

The presence of traditional baubles in the green waste stream is a direct pollution of the waste stream and may cause operational problems, decrease in the quality of the final compost, or causing the whole load to be rejected are all very much possible (159).

Polystyrene

Polystyrene is most commonly used as a plastic replacement for traditional Christmas baubles. Polystyrene is also widely used in packaging and disposable items such as cups, plates, cases. Regardless of its application for disposable items, polystyrene is non-biodegradable and non-compostable. Styrene can currently only be produced using a fossil-based resource (167).

Polystyrene can also be incinerated, however, the net carbon-equivalents are not 'compensated' for as is the case with, for example, PLA and bio-PE (167).

If polystyrene is left it can take hundreds to thousands of years to decompose. It is also easily carried by the wind and may litter streets or water bodies. In the environment, polystyrene might fall apart into smaller pieces of polystyrene, which can be easily ingested by marine life (167).

If a polystyrene-based bauble does make it into the green waste stream which is quite unlikely, it poses a scenario very similar to that of discarding bio-PE using this waste stream. Polystyrene is also not compostable or biodegradable, meaning that operational problems, decrease in the quality of the final compost, or causing the whole load to be rejected are all very much possible (159) (167).

Wooden ornaments

Wooden ornaments are almost always treated with a substance to preserve the wood. In this case, pentacryl is assumed to be the substance used in treatment of the wood.

Wooden ornaments that end up in the residual waste streams are incinerated like all other residual waste. One benefit of wooden ornaments (similar to biopolymers), is that they have a short carbon cycle when incinerated.

In general terms, leaving wooden ornaments in the environment might not sound that bad. However, the products used to treat the ornaments may decrease its susceptibility to degradation and are sometimes substances that are harmful to the environment. However, pentacryl is a readily biodegradable substance with toxicity to the environment only occurring at high quantities (168).

There is very little information available about the processing of treated wood in composting plants. In general, treated wood types are not accepted because they may leach arsenic substances to the compost, making the composting load unusable. Whether this is also applicable for wood treated with pentacryl is not clear (154).

XII Appendix: Technical information

This appendix includes information regarding the technical production capacity assessment prior to the assessment at BATO scale.

Pre-treatment

The steps included in the pre-treatment estimation are resource drying and resource sifting. For drying, it takes approximately 8 hours to dry a batch of 1 kilo. This would effectively translate to 0.02 ($2.5/1000*8$) hours per ball (= 1.2 minutes) or 0.08 hours (=4.8 minutes) for a set of four.

Roughly 200 grams of pine needles are able to be sieved per hour, which translates to roughly half a minute per bauble ($2.5/200*60$), and roughly two minutes for a set.

Considering the process is currently a batch-process and not continuous, the processing of 1 kilo of dried needles, would require roughly 5 hours of sifting (5+ 8 hours = 13 hours in total), producing roughly 400 ($1000/2.5$) baubles (= 100 sets).

However, it is assumed that the pre-treatment process is more efficient, as both steps can be executed simultaneously, assuming a batch process. This would mean that the higher value (drying time) determines the required time for pre-treating 100 sets (8 hours = almost 13 sets an hour = close to 50 baubles per hour).

Production and assembly

The processing steps included in this part of the assessment are the twin-screw extruder to combine both components, cooling down of the filament, shredding of the filament, injection molding of the granules and clicking the two halves together.

The extruding, cooling and shredding of the filaments/granules was estimated to be roughly 4-5 minutes per set based on the Avans scale. The injection molding of the granules and combining of the two halves was estimated to be around 4 minutes per set. Both of these estimations were based on information discussed with Wilner Acosta.

Packaging

The packaging estimation includes the folding of the packaging and insertion of the set. This was assumed to be roughly 5 minutes per set and is expected to be much shorter on industrial scale. This was also based on discussion with Wilner Acosta.

Total estimation

Taking all previous assessments into account, the total time required to produce one set of Christmas baubles can be estimated. For pre-treatment it equals roughly 5 minutes per set (100 sets per 8 hours = 0.08 hours per set = 4.8 minutes), 4-5 minutes for compounding, 4 minutes for molding and formation, and 5 minutes for packaging. This totals up to roughly 19-20 minutes per set in one batch.

Scaling up the production process

Currently, the production capacity and process at CoE BBE is limited. Several adjustments and investments would be required when considering scaling up the production process. There has been a distinction between production at Avans (current), production at BAC and outsourced production. The production process at Avans is limited to testing and not full production.

Production at BAC

The first step of scaling up is presumed to be production at BAC. The drying process has currently been estimated to consist of 8 hours per kilo at 50°C. For sifting, it's 1 hour per 200grams. The contribution

of drying time per set was set at 4.8 minutes per set. For sifting, this is roughly 2 minutes per set. Assuming these can occur at the same time, pre-treatment time of 1 kilo in 8 hours = 50 baubles an hour.

At BAC, both the drying and sifting process might be expanded. This means that a larger quantity of needles can be dried per 8 hours and a larger quantity of needles can be sifter per hour. Assuming these quantities can be increased by twofold, the required pre-treatment time also decreases by twofold = 2 kilo in 8 hours = 100 baubles an hour. This would mean that pre-treatment for the same quantity would reduce to 2.5 minutes.

The processing step includes compounding (the extruding, cooling and shredding of the filaments/granules, est. 4-5min), injection molding and assembly (est. 4 min). For this processing step, twice the capacity is assumed (either through optimization or bigger machinery), just like the pre-treatment. This would reduce the compounding to 2-2.5min and molding to 2min per set.

Packaging is currently estimated at 5 minutes per set. On BAC scale, this is expected to be reduced to 2-3 minutes. This means that the total capacity at BAC would come down to a pre-treatment of 2.5 minutes per set, compounding of 2-2.5 min per set, molding of 2 min per set and packaging 2-3min per set, which totals 8.5-10 minutes per set.

Whether these reductions are capable due to a higher efficiency of the machinery, or by increasing the quantity of machinery is not yet clear. The production capacity at BAC is limited to only a couple hundred of baubles. For quantities in the quadruple digits, Bato is more convenient.