The TAFU-BCS Award

2024-2025

Seedrify: Establishing the Future of Sustainability

Team EcoVibe

Rayaan Rafique, Mohammed Abdulla Bagosher

TABLE OF CONTENTS

Executive Summary

An inventive environmentally responsible way to combat plastic pollution, e-trash, and loss of biodiversity is the Seedrify where seed stands for growth and rify stands for turning things into environmentally friendly, plantable solutions.These phone cases, which are made of biodegradable materials like PLA, bamboo fiber, and mycelium, shield phones while decomposing organically as their useful lives are coming to an end. The case has seeds on it to develop plants that foster biodiversity and pollinator support. The device satisfies consumer demand for sustainable technology while promoting the circular economic principles by combining durability, eco-friendliness and user interaction. It is effective and scalable, it promotes sustainability, lowers waste, and raises environmental consciousness.

Introduction

We are pleased to present a product that unites both technology and the environment in a world where they frequently appear to be at odds, presenting Seedrify where innovation meets nature. This is a message, a solution, and an initiative in the direction of a more environmentally friendly future, it's more than just a phone case. Consider a phone cover that benefits the environment in addition to protecting the device. The cases are made entirely of biodegradable materials and are intended to decompose on their own when done utilizing them. The catch is that each phone case contains seeds that develop into lovely plants, such as vegetables, herbs or wildflowers. After the phone case has accomplished its goal, just plant it in the soil, give it some water, and see it grow into something vibrant and living. This matters for the planet, human beings, and for the future.

Objectives

1. Encourage the Sustainability of the Environment

- Provide a completely biodegradable substitute for conventional phone cases to cut down on plastic and e-waste by making use of environmentally friendly materials that decompose organically, such as PLA, bamboo fiber, and mycelium.

2. Promote the use of the sustainable economy

- Establish a closed-loop framework in which goods are made to be recycled, regenerated or utilized again at the end of their useful lives by creating phone covers that are planted to produce plants, converting trash into something that will benefit the environment.

3. Create a Powerful, Purpose-Driven Brand

- Create a brand that represents creativity, sustainability, and a favorable influence on the environment by aligning every facet of the company with the goal of advancing sustainability, from marketing to product design.

4. Minimize the Carbon Footprint

- Reduce the carbon impact associated with the manufacture and disposal of phone cases by utilizing biodegradable and renewable resources. Locate materials locally if possible andmake sure the manufacturing process uses less energy.

5. Encourage the use of green spaces and biodiversity

- Increasing biodiversity by producing plants that attract insects, such as butterflies and bees by adding seeds for vegetables, herbs, or wildflowers that are indigenous to different temperatures and areas.

6. Bringing Eco-Friendliness and Functionality together

- Showing that eco-friendly products can be just as practical, long-lasting, and fashionable as their conventional counterparts by creating phone covers using eco-friendly fabrics that shield the devices from drops, scratches, and normal use.

7. Promote Sustainability Awareness

- Informing customers on the harm that plastic waste causes to the environment and the value of making sustainable decisions with every product by providing information regarding composting, seed planting, and biodegradability.

These goals offer an accurate plan for creating, introducing, and expanding the biodegradable phone cases with seed inclusion.

This report will cover the following:

1. Design and Concept of the Product

- Create an environmentally friendly phone case that decomposes naturally using materials like PLA, bamboo fiber, or mycelium.
- Include seeds in the case material.
- Making sure the case is biodegradable, long-lasting, and aesthetically pleasing.

2. Material Selection and Testing

- Examine and choose biodegradable materials that strike a balance between compostability and durability.
- Check the materials strength and ability to withstand drops. Rates of biodegradation in soil, industrial compost, and home compost in different environments.
- Assure that the seeds are viable for the duration of the case for one-two years.

3. Prototype Development

- Utilizing Blender software to produce 3D models of the phone case.
- Create prototypes with 3D printing.
- Try prototypes on particular phone models to ensure they fit and work properly. Rates of post-planting seed germination. User opinions on usability and design.

4. Assessment of the Environmental Impact

- Assess the product's capacity to cut down on e-waste and plastic trash.
- Examine how much carbon is produced and disposed of in comparison to conventional phone cases.
- Evaluate the seeds benefits for biodiversity.

5. Market Analysis and Viability

- Determine the target market, which may include tech enthusiasts, gardeners, and eco-conscious shoppers.
- Examine rivals such as Pela Case and Wave Case and pinpoint market gaps.
- Determine how much demand there is for eco-friendly tech accessories.
- Analyze the viability of manufacturing(cost, supply chain logistics, and scalability).

6. Strategy for Marketing and Launching

- Create a brand design that highlights innovation and sustainability.
- Develop a marketing strategy that uses influencers, social media, and eco-friendly marketplaces to reach consumers that care about the environment.
- Launching a crowdfunding campaign on sites like Kickstarter to raise money and create publicity.

7. Challenges and Solutions

- Dealing with possible issues like maintaining seed viability across the cases's lifecycle, striking a balance between biodegradability and durability, controlling manufacturing expenses and scalability.
- Provide ways to get around these obstacles.

8. Future Prospects

- Examine potential avenues for product line expansion(biodegradable tablet, laptop, or other tech accessory cases).
- For upcoming versions, look into additional seed varieties or materials.
- Think of collaborating with environmental projects or eco-friendly groups.

Methodology

1. Research and Concept Development

- Review the literature on biodegradable materials, such as PLA, mycelium or bamboo fiber.
- Investigate the technology of plantable seed paper in order to comprehend the viability of seeds in biodegradable products.

- Examineexisting biodegradable phones cases to determine their advantages and disadvantages.

2. Selection of Materials and Formulation

- Test a range of biodegradable substances for durability, flexibility, and compostability.
- Select seeds that are resistant to storage and activate when planted.

3. Prototype Development

- Utilize Blender software to create the phone case's 3D model.
- To assess shape, fit, flexibility, use biodegradable filaments in 3D printing.
- For increased accuracy and scalability, use injection molding.
- Using two techniques to include seeds into the phone case:
- Placing seeds between the biodegradable layers.
- When seeds come into contact with soil and moisture, the bio-coating that surrounds them dissolves and releases the seeds.

4. Data Collection and Testing

- **Durability Testing:** To assess the strength and longevity of the case, use bend, drop, and scratch tests.

- **Biodegradability Testing:** Prototypes should be buried in soil and their rates of decay tracked over time. Test under settings for both residential and commercial compost.

- **Seed Germination Testing:** Create plant prototypes and track the development and germination rates of seeds.

- **User Testing:** A limited sample of users should be given prototypes to evaluate for comfort, functionality, and design.

5. Analysis and improvement of Data

- Gather quantitative information on durability performance, seed germination rates, and biodegradation rates.
- Compare various material compositions using statistical analysis.
- Based on the results, modify the material compositions to maximize strength and balance breakdown.
- Enhance methods for placing seeds to increase the likelihood of germination.
- Examine customer reviews to find recurring themes and areas that need work.
- Examine the product's efficiency in comparison to other biodegradable options and conventional phone cases
- To increase effectiveness, try up several seed varieties.
- Add the QR Code which offers growth monitoring, planting guidelines, and instructional materials.

6. Optimizing the final prototype and determining its commercial viability

- Create the final design with the best possible seed placement and material composition.
- Carry out user trials to evaluate customer opinion and experience.
- Assess the cost-effectiveness and scalability of large-scale production.
- Create a sustainable packaging option that supports the eco-friendly idea of the product.

Limitations encountered

- Long-term storage may cause the seeds contained in the case to lose their ability to survive.

- Variety is limited because only specific kinds of seeds can be embedded in phone cases.

- The product's effectiveness in some areas may be limited because the seeds might not grow well in all temperatures.

- It may take a lot of education to get consumers to grasp the advantages of biodegradable cases with seed inclusion on it.

Development

- An environmentally beneficial substitute for conventional plastic phone cases is the biodegradable phone case with seed inclusion. This invention is intended to protect smartphones while they are in use and break down into the soil after being disposed of, leaving behind seeds that eventually grow into plants, in contrast to conventional cases that go to the trash generated by plastic. By combining plantable seeds with biodegradable materials, this idea makes sure that discarded phone casesbenefit the environment. The two main issues facing the world today are plastic waste and biodiversity loss which are intended to be addressed by this product. The phone case's innovative feature is the combination of seed inclusion with biodegradable materials that safeguard the phone providing both style and durability, biodegrades naturally meaning reduces plastic waste by dissolving into substances that are not harmful when discarded of and develops into plants when the phone case is placed in soil.

What makes it unique?

1. **Practicality and Sustainability:**shields the phone from everyday wear and tear, drops, and scratches. When its life is over, it can be used to produce plants, converting garbage into something that is good for the environment.
2. **Circular Design:** there is zero waste as the phone case biodegrades and produces new plants rather than ending up in a trash bin and it is regenerative as by providing food for pollinators like bees and butterflies, the seeds sustain biodiversity.
3. **User Interaction:** an intimate bond with the environment is formed via planting the phone case and seeing it flourish. Also, users gain knowledge about gardening, composting, and biodegradability.

4. **Unique Aesthetic and Story:** the case is a statement piece that displays the user's dedication to sustainability and goes beyond simply being a tech accessory. Customers who care about the environment are moved by the product's story of transforming trash into life.
5. **Integration of technology:**QR code for measuring growth and providing planting suggestions.

What inspired the development of this idea?

- Every year, more than 1.5 billion phone cases are marketed worldwide, and the majority are composed of plastic that takes hundreds of years to break down. Microplastic contamination and landfill overflow are caused by discarded plastic phone covers. The majority of mixed-material phone cases wind up in landfills due to inadequate recycling facilities, which are bad for the environment. The concept of inserting seeds to promote biodiversity was sparked by the fall in pollinators like bees and butterflies as a result of declining habitat and pollution. This inspired usto develop a naturally decomposing, zero-waste substitute that doesn't contribute to pollution.

- Since consumers are more conscious of environmental issues and global warming, they are actively searching for eco-friendly items. Customers' willingness to embrace eco-friendly accessories was demonstrated by the popularity of biodegradable phone cases like Pela Case. This inspired us to extend the idea of plantable biodegradable phone cases to provide further environmental advantages.

- A frequent medium for environmentally friendly advertising items isseed paper, which is biodegradable and contains plant seeds embedded in it. This idea led to the incorporation of plantable technology into a phone case, resulting in a product that has a second life after being thrown away.

- The idea was also inspired by the principle of cradle-to-cradle design, which states that a product should naturally return to its surroundings.

The Impact of the innovation:

1. Deals with Plastic Waste as this product provides a waste-free substitute.
2. Encourages Biodiversity.
3. Promotes Eco-friendly Conduct.
4. Establishes New Paradigms for Tech Accessories as it forces the tech sector to reconsider how goods are made, utilized, and discarded.

Research

1. Biodegradable Materials

- Polylactic Acid, which is a biodegradable plastic made from sugarcane or cornstarch, Mycelium which is a substance derived from mushrooms that is utilized for construction materials, furniture and packaging and Bamboo Fiber is an organic, renewable substance utilized in environmentally friendly items, furniture, and textiles are the existing technologies. By combining these materials, the invention produces a phone cover that is both biodegradable and long-lasting, protecting devices while decomposing organically at the end of its useful life. In contrast to other biodegradable phone covers on the market, this product incorporates seeds into the material, transforming waste into life.

2. Products with Seed Embedding

- Seed paper is utilized for packaging, wedding invitations, and greeting cards and Plantable Packaging help engage customers and cut down on waste are the existing technologies. The invention makes use of the idea of incorporating seeds by modifying seed paper concept into commonplace items to produce a useful, engaging experience. This invention applies the idea to a long-lasting, robust product(phone case) that fulfills a useful function prior to being planted, whereas seed paper and plantable packaging are usually utilized for disposable goods.

3. Eco-Friendly Technology Accessories

- Pela Case is composed of plant-based materials and Wave Case is made from recycled materials are the existing technologies. By providing a biodegradable substitute for conventional phone cases, the idea builds on the success of these brands. In contrast to Pela and Wave Case, this innovation adds a regenerative element by encouraging users to plant the case by embedding seeds.

How was the idea developed and refined?

- Realizing the negative effects of plastic and e-waste, especially from technology items like phone covers, on the environment gave rise to the concept, then based on research on seed-embedded products and biodegradable materials, the idea was born. The team discussionon how to integrate sustainability, usability, and efficiency. In order to produce a sustainable product that benefits the environment, the idea of inserting seeds in a phone case came about.

- Examine the appropriateness of biodegradable materials for phone cases, such as PLA, mycelium, and bamboo fiber. Then, check initial testing for seed compatibility, compostability, and material lifespan. Investigated resilient seeds that would effectively sprout and last the phone case’s existence.

- UtilizeBlender to create 3D models of the phone cover and then experiment with several seed insertion strategies to guarantee a solid framework and uniform distribution. Commitment to producing a useful, fashionable, and user-friendly product. Also, make sure the case is safe from

dents and drops and suits certain phone types comfortably.Also, add QR code to improve user interaction.

Approach and Implementation

Step 1: Research and Development

- Examine a variety of biodegradable materials for composting, adaptability, and longevity.
- Select resilient seeds that will sprout when planted and survive storage.
- Create a material composition that gives seed viability, strength and biodegradability equal weight.
- To shield the seeds from heat, moisture, and early germination, applying seed-coating technology.

Step 2: Prototype Development

- Make a 3D model of thephone cover using Blender.
- Use biodegradable filaments to print early prototypes in order to evaluate flexibility, suitability, and form.
- When creating prototypes, utilize injection molding for greater accuracy and scalability.
- Utilize one of two methods to embed seeds:
    1. Put seeds in layers that decompose naturally.
    2. Utilize a bio-coating, which releases the seeds when it comes into contact with soil and moisture.

Step 3: Testing and Gathering Information

- Durability Testing to assess longevity and impact resistance, perform stress, flexibility, and drop tests.
- Biodegradable Testing to monitor the rates of decomposition in soil burial and composting environments over a few weeks.
- Seed Germination Testing to examine the germination rates and viability of seeds in a controlled environment.
- Give prototypes to a limited number of consumers to get their opinions on the design, ease of use, and effectiveness.

Step 4: Data Analysis and Refinement

- Compile quantitative information on germination of seed rates, biodegradation rates, and durability efficiency.
- Utilize statistical tools to compare seed planting methods and material compositions.
- To maximize strength and biodegradability, alter the composition of the materials.
- Improve the seed positioning techniques to boost germination rates.

Step 5: Final Prototype Optimization

- Make the final design using the optimal material combination and seed location
- Trials with a bigger user base should be conducted to assess customer feedback and experience.
- Examine the potential and cost-effectiveness of massive production.
- Create packaging with biodegradable materials to go along with the eco-friendly theme.

Step 6: Production and Scaling

- Establish injection molding procedures for large-scale manufacturing.
- collaborate with vendors of seeds and biodegradable products.
- Guarantee a steady supply chain for components and raw materials.
- To guarantee that every case satisfies requirements for durability, biodegradability, and seed viability, put quality control procedures into place.

Step 7: Marketing and Launch

- Create a brand identity that highlights innovation and sustainability.
- Start a marketing campaign aimed at tech enthusiasts, business clients, and environmentally sensitive consumers.
- Promote the product using eco-friendly marketplaces, social media, and social media influencers.
- Educate consumers about the product's beneficial environmental impacts and case planting techniques.

Step 8: Post-Launch Monitoring and Improvement

- Get clients feedback to determine what needs to be improved.
- Monitor the product's effects on carbon emissions, biodiversity encouragement, and the decrease of plastic waste.
- Make changes to the product in response to feedback and new developments in seeds, materials, and technology integration.
- Look into ways to broaden the product range to include cases for new markets or other devices such as tablets or laptops.

Challenges Faced:

Obstacle: it was challenging to make sure the seeds could sprout after being planted and stayed robust during the phone case's(1-2 years) lifecycle. When seeds are exposed to heat and dampness, they may become less viable.

Solution: select resilient seeds that can tolerate environmental challenges. The seeds should be covered with a bio-coating to prevent harm while in use and to allow them to be released once exposed to soil and moisture. Also, include precise directions on how to maintain the case(for example, in a dry, cold spot) in order to preserve seed viability.

Obstacle: the cost of producing biodegradable materials, such as PLA or mycelium, can be higher than that of conventional plastics.

Solution: by combining materials with less expensive natural fibers, increasing output to cut prices per unit, and streamlining production procedures like injection molding. A higher price can also be justified by using government incentives, sourcing resources locally, and informing customers about the advantages for the environment.

Obstacle: it was difficult to strike a balance between biodegradability and durability. PLA and Mycelium, two biodegradable polymers, could not be as robust as conventional plastics**.**

Solution: PLA should be used with natural fibers to increase strength without compromising biodegradability. In high-stress places such as corners and edges, structural reinforcements should be added to increase longevity without sacrificing compostability.

Obstacle: it can be difficult to persuade customers to replace their conventional phone cases with new, environmentally friendly models, particularly if they are not familiar with seed-embedded or biodegradable materials.

Solution: start advertising initiatives to educate people about the advantages of biodegradable phone cases and the harm that plastic waste causes to the environment. Encourage customers to plant their cases and see them grow, making sustainability entertaining and engaging. Offering packaged deals, loyalty plans, or discounts to draw in budget-conscious customers.

Prototype

This 3D render showcases the design concept of the biodegradable case with the integrated seed inclusion feature. A few different color and design variations are presented to portray that aesthetic freedom is still retained while achieving sustainability and biodegradability. The circular part in the center of the case neatly envelopes the seed between layers of biodegradable material, securely protecting it and adding a unique design touch to the case. The case on the right is cut in half to showcase the innovative seed

inclusion method and reveal the seed enveloped within. This picture emphasizes the sustainability goal of the project while also portraying its aesthetic brilliance, aiming to reach a wider audience and create a strong sustainable impact.

Impact and Sustainability

1. Environmental Impact

- Every year, more than 1.5 billion phone covers are marketed, most of which are composed of non-recyclable polymers. Conventional phone cases contribute to landfill pollution since they take more than 400 years to break down. Biodegradable phone cases eliminate scraps of microplastic by decomposing them in 3-6 months.

- Thrown away phone covers can now produce plants instead of filling landfills due to the seed inclusion option. The concept promotes eco-friendly gardening and green spaces in urban environments.

- Conventional plastic phone cases use materials made from petroleum, which increases CO2 emissions. During manufacture, a reduction of 60% in C02 is released by plant-based polymers like PLA. Millions of tons of plastic garbage might be avoided each year with widespread use.

2. Economic Impact

- The market for environmentally concerned consumers is expanding, as 75% of Gen Z prefers sustainable items.By the year 2027, it is anticipated that the worldwide market for biodegradable plastic would have grown to $12.1 billion.Brands of tech accessories might profit from the trend by including biodegradable cases in their lineups.

- The adoption of biodegradable materials creates new employment opportunities in the recycling, eco-manufacturing and bio-polymer research sectors. Programs for case disposal, cultivation, and seed sourcing might involve local communities.

3. Social and Behavioral Impact

- Inform customers about ethical consumerism and biodegradable materials. Raises awareness of environmental rehabilitation and planting. Allow customers to actively plant their cases after usage, creating a participatory eco-experience.

- Biodegradable phone cases can be distributed by companies, NGOs, and schools as part of sustainability programs. Environmentally friendly items could be encouraged by governments through tax breaks or subsidies.

An innovative method of sustainable living is the biodegradable phone cases with seed insertion. In addition to promoting eco-conscious consumption and supporting worldwide reforestation initiatives, it directly targets the pollution caused by plastic waste.

The increasing demand for environmentally friendly consumer goods and developments in biodegradable materials make the biodegradable phone case with seed inclusion a promising candidate for scalability and broad use.

1. Scalability

- 75% of Millennials and Gen Z choose eco-friendly items, indicating that consumers are increasingly looking for sustainable ones. By 2027, it is anticipated that the worldwide market for biodegradable plastics would reach $12.1 billion. Due to the commitment to sustainability made by major tech corporations, environmentally friendly phone cases are becoming a profitable commodity.

- Scaling production is affordable when using biodegradable polymers for 3D printing and injection molding. Bamboo fiber, PLA, and mycelium are biodegradable materials that are already in use in industry and can be modified for use in phone cases. It is possible to effectively incorporate seed encapsulation innovation into large-scale manufacturing processes.

- Can be sold both in physical locations such as Apple, Samsung, eco-friendly stores and online such as Amazon, Shopify. Prospects for collaboration with digital firms, environmental NGOs, and environmentally aware brands. Corporate environmental campaigns find it attractive due to the availability of custom branding options.

2. Practicality

- Shock resistance and phone safety are guaranteed by enhanced composites made from plants(PLA and wheat straw fiber). Coatings that are resistant to heat and waterproof increase case longevity to line with that of conventional plastic cases. Intend to avoid early degradation by only decomposing completely after disposal.

- The case can be buried in soil after use, where it will break down and release seeds that will eventually grow into plants. Also, it has a QR code for disposal assistance and detailed directions. Compostable at home in three to six months, no additional amenities are required.

- Bulk production reduces expenses, the pricing is comparable when compared to conventional plastic cases. Costs can be further decreased by possible incentives from governments for eco-friendly products.

Future Development:

The idea of this project has a huge scope for improvement both socially and economically, some examples include:

1- Expanding the product line

a. Introducing biodegradable cases for tablets, laptops and even smartwatches can allow the product to reach a wider audience and create a stronger impact on adopting sustainability.
b. Other biodegradable tech gadgets like airpods cases or phone grips could introduce the concept to new markets.

2- Smart integration and technology enhancements

a. Creating a companion app that can track growth and keep track of multiple plants at once could allow users to better take care of their planted seeds and make audience adoption smoother.
b. Building a smart pot embedded with sensors can serve as a good addition to the app for better and more accurate readings.

3- Improved biodegradability and seed viability

a. Developing a better biodegradable material that is also compatible with normal FDM 3d printers can reduce product cost and ramp up development and production speeds.
b. Using more advanced seed enclosures can enhance compatibility with more seed types, and in turn expand the product range.

4- Enhanced strength

a. Reinforcing biodegradable materials by mixing PLA with natural fibers or bioplastics.
b. pushing the limits of strength and durability while speeding up the decomposition process in the right conditions.

5- Customizations and aesthetics enhancements

a. Offer personalized designs using generative AI with custom logos and brandings, as well as customized choices of embedded seeds.
b. Experimenting with natural dye variations to create more vibrant designs.

6- Supply chain and sustainability enhancements

a. Use locally sourced bamboo fibers, mycelium, or PLA to minimize carbon footprint.
b. Partner with farmers and local organizations to create job opportunities and increase impact.

Phase	Timeline	Key Activities
Research & Concept Development	Month 1-3	- Market research on eco-friendly phone cases - Material and seed selection - Initial design sketches and 3D models
Prototype Development & Testing	Month 4-6	- 3D printing of prototypes - Durability, biodegradability, and seed viability tests - User testing and feedback collection
Manufacturing and Pre-launch	Month 7-9	- Scaling up sustainable production - Branding and eco-friendly packaging design - Marketing and influencer collaborations
Market Launch & Distribution	Month 10-12	- Crowdfunding and e-commerce sales launch - Retail distribution setup - Customer education and engagement programs
Expansion & Future Improvements	Year 2+	- More design variations and color options - Advanced biodegradable materials - Take-back and recycling programs - Partnerships with environmental organizations

Conclusion

A ground-breaking invention, the Seedrify tackles important environmental issues including plastic contamination, e-waste, and declining biodiversity. This invention provides a sustainable solution that not only safeguards phones but also benefits the environment by bringing sustainability, efficiency and user interaction together. In addition to the biodegradable components that guarantee the case decompose organically without endangering the environment, while the embedded seeds transform trash into life by assisting pollinators and maintaining biodiversity. This invention might spread throughout the world with careful planning, effective manufacturing, and effective consumer education, spurring a trend towards environmentally responsible technology devices and a future that is better for the environment. By motivating customers to take an active role in sustainability, this product not only lessens its negative effects on the environment but also strengthens the bond between humans and the environment. Additionally, the invention challenges businesses to reconsider how things are made, utilized, and disposed of, setting a new benchmark for the tech industry. Its success could encourage other developments in circular economic principles and biodegradable materials, which would have an impact on many businesses. It sets the stage for the future in which both sustainability and innovation coexist peacefully in our daily lives by transforming commonplace technology accessories into tools for environmental restoration.

References

1. Casiño, Valerie Joyce A., et al. “Characterization of Cornstarch-Based Bioplastic Reinforced with Three Different Species of Bamboo Shoots.” *American Journal of Environmental Protection*, vol. 11, no. 1, 28 June 2023, pp. 25–33, pubs.sciepub.com/env/11/1/4/index.html#:~:text=In%20conclusion%2C%20based%20on%20the, https://doi.org/10.12691/env-11-1-4. Accessed 16 Mar. 2025.
2. Cho, Renee. “The Truth about Bioplastics.” *State of the Planet*, Columbia Climate School, 13 Dec. 2017, news.climate.columbia.edu/2017/12/13/the-truth-about-bioplastics/. Accessed 16 Mar. 2025.
3. https://www.facebook.com/mybhg. “Keep Your Garden Seeds Fresh from Year to Year with These 5 Storage Tips.” *Better Homes & Gardens*, 2025, www.bhg.com/how-to-store-seeds-8765551? Accessed 16 Mar. 2025.
4. https://www.facebook.com/realsimple. “6 Reasons Your Seeds Aren’t Sprouting—and How to Fix Them to Save Your Spring Garden.” *Real Simple*, 2025, www.realsimple.com/why-seeds-arent-sprouting-11697647? Accessed 16 Mar. 2025.
5. https://www.facebook.com/setimerenptah. “How Do Case Manufacturers Test Their Rugged Cases?” *Digital Trends*, 30 Sept. 2016, www.digitaltrends.com/mobile/rugged-smartphone-case-testing/.Accessed 16 Mar. 2025.
6. https://www.facebook.com/thespruceofficial. “Can You Use Old Seeds for Seed Starting? Gardening Pros Weigh in with Their Best Tips.” *The Spruce*, 2025, www.thespruce.com/can-you-use-old-seeds-for-seed-starting-8767249? Accessed 16 Mar. 2025.
7. Measurlabs, Ida Tarko. “Biodegradability and Compostability Testing Standards | Measurlabs.” *Measurlabs.com*, 12 Apr. 2024, measurlabs.com/blog/biodegradability-compostability-standard-testing/.Accessed 16 Mar. 2025.
8. Mitelut, Amalia Carmen, and Mona Elena Popa. “Seed Germination Bioassay for Toxicity Evaluation of Different Composting Biodegradable Materials.” *ROMANIAN BIOTECHNOLOGICAL LETTERS*, vol. 16, no. 1, 1 Jan. 2011, pp. 121–129, www.researchgate.net/publication/263768121_Seed_germination_bioassay_for_toxicity_evaluation_of_different_composting_biodegradable_materials.Accessed 16 Mar. 2025.
9. Saunders, Peter. “Does Seed Paper Actually Work?” *Afterhourscreativestudio.com*, After Hours Creative UK, 20 Sept. 2023, www.afterhourscreativestudio.com/blog/post/does-seed-paper-actually-work? Accessed 16 Mar. 2025.
10. ---. “Does Seed Paper Actually Work?” *Afterhourscreativestudio.com*, After Hours Creative UK, 20 Sept. 2023, www.afterhourscreativestudio.com/blog/post/does-seed-paper-actually-work?Accessed 16 Mar. 2025.
11. TÜV Rheinland. “Biodegradability Testing of Products.” *Tuv.com*, 2025, www.tuv.com/world/en/biodegradability-testing.html? Accessed 16 Mar. 2025.
12. Wikipedia Contributors. “Biocomposite.” *Wikipedia*, Wikimedia Foundation, 17 Nov. 2018, en.wikipedia.org/wiki/Biocomposite.Accessed 16 Mar. 2025.
13. Ankarlid, Anders. “The 1 Billion Plastic Phone Case Problem.” *Medium*, 27 Jan. 2022, aa-88162.medium.com/the-1-billion-plastic-phone-case-problem-4f4431e227ce.Accessed 16 Mar. 2025.
14. Bentley, Tayla, et al. “Plantable Seed Paper: A Beautiful Way to Reduce Paper Waste – Planet Blue Ambassador.” *Planet Blue Ambassador*, 20 Nov. 2020, pba.umich.edu/plantable-seed-paper-a-beautiful-way-to-reduce-paper-waste/.Accessed 16 Mar. 2025.
15. Chen, Chen, et al. “Properties and Applications of Bamboo Fiber–a Current-State-of-the Art.” *Journal of Renewable Materials*, vol. 10, no. 3, 2022, pp. 605–624, discovery.ucl.ac.uk/id/eprint/10136441/1/TSP_JRM_44743.pdf, https://doi.org/10.32604/jrm.2022.018685.Accessed 16 Mar. 2025.

16. Johnston, Eddie, and Grace Brewer. “Mycelium: Exploring the Hidden Dimension of Fungi | Kew.” *Www.kew.org*, 11 Mar. 2023, www.kew.org/read-and-watch/fungi-hidden-dimension.Accessed 16 Mar. 2025.
17. Madhavan Nampoothiri, K., et al. “An Overview of the Recent Developments in Polylactide (PLA) Research.” *Bioresource Technology*, vol. 101, no. 22, 1 Nov. 2010, pp. 8493–8501, www.sciencedirect.com/science/article/pii/S0960852410009508, https://doi.org/10.1016/j.biortech.2010.05.092.Accessed 16 Mar. 2025.
18. National Geographic Society. “Global Warming.” *Education.nationalgeographic.org*, National Geographic, 14 Dec. 2022, education.nationalgeographic.org/resource/global-warming/.Accessed 16 Mar. 2025.
19. Nickel, Lena. “Cradle-To-Cradle: What Is It & How Does It Work in LCA?” *Ecochain*, 19 Mar. 2024, ecochain.com/blog/cradle-to-cradle-in-lca/.Accessed 16 Mar. 2025.
20. PELA. “Eco-Friendly IPhone, Google and Samsung Cases - 100% Biodegradable– Pela Case.” *Pelacase.com*, 2017, pelacase.com/.Accessed 16 Mar. 2025.
21. Akhtarul Islam Amjad. “Bamboo Fibre: A Sustainable Solution for Textile Manufacturing.” *Advances in Bamboo Science*, vol. 7, no. 2773-1391, 1 May 2024, pp. 100088–100088, https://doi.org/10.1016/j.bamboo.2024.100088.Accessed 16 Mar. 2025.
22. Cho, Renee. “The Truth about Bioplastics.” *State of the Planet*, Columbia Climate School, 13 Dec. 2017, news.climate.columbia.edu/2017/12/13/the-truth-about-bioplastics/.Accessed 16 Mar. 2025.
23. Ellis, R. H., et al. “Seed Moisture Content, Storage, Viability and Vigour.” *Seed Science Research*, vol. 1, no. 4, Dec. 1991, pp. 275–279, https://doi.org/10.1017/s0960258500001008. Accessed 16 Mar. 2025.
24. Lasprilla, Astrid J.R., et al. “Poly-Lactic Acid Synthesis for Application in Biomedical Devices — a Review.” *Biotechnology Advances*, vol. 30, no. 1, Jan. 2012, pp. 321–328, https://doi.org/10.1016/j.biotechadv.2011.06.019.Accessed 16 Mar. 2025.
25. Team, Editioral. “Utilizing Mycelium to Replace Plastics for Sustainable Packaging.” *Digicomply.com*, SGS Société Générale de Surveillance SA, 3 July 2024, www.digicomply.com/blog/utilizing-mycelium-to-replace-plastics-for-sustainable-packaging.Accessed 16 Mar. 2025.
26. Ankarlid, Anders. “The 1 Billion Plastic Phone Case Problem.” *Medium*, 27 Jan. 2022, aa-88162.medium.com/the-1-billion-plastic-phone-case-problem-4f4431e227ce.Accessed 16 Mar. 2025.
27. Chee, Foo Yun. “EU Seeks Feedback on Looser State Aid Rules to Spur Clean Tech Projects.” *Reuters*, 11 Mar. 2025, www.reuters.com/sustainability/eu-seeks-feedback-looser-state-aid-rules-spur-clean-tech-projects-2025-03-11/.Accessed 16 Mar. 2025.
28. First Insight. “The State of Consumer Spending: Gen Z Shoppers Demand Sustainable Retail.” *Firstinsight.com*, 2017, www.firstinsight.com/white-papers-posts/gen-z-shoppers-demand-sustainability?form=MG0AV3, https://doi.org/10658881547/1652884390359/module_10658881547_FI_Styled_form.Accessed 16 Mar. 2025.
29. Nations, United. “Plastics – Fueling Oil Demand, Climate Change and Pollution | United Nations.” *United Nations*, 2019, www.un.org/en/climatechange/science/climate-issues/plastics? Accessed 16 Mar. 2025.

Appendices

Prototype

This is Seedrify where innovation meets nature. Referred to Pela Case and Wave Case for inspiration.