

The background of the entire page is a photograph of a forest floor. It features a dense carpet of green moss and ferns. A light-colored, sandy or gravelly path winds through the vegetation, leading the eye from the bottom center towards the top left. The lighting is natural, creating soft shadows and highlights on the plants.

Sustainability Progress Report

2023





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Introduction

IMPACT = INNOVATION + INTEGRITY

Sustainability is central to Spiber's mission. Faced with the reality of a world with limited resources, we are devoted to developing new materials which can have a transformational impact on society.

In 2022, we created our first Sustainability Impact Report, which outlines Spiber's strategy towards maximizing our potential for positive impact and defines the ambitions and targets we aim to achieve moving forward. As our first Progress Report, this document shares how far we have come towards those goals by using our concept of **Impact = Innovation + Integrity** as a framework to encompass the topics that are most material to our business and our stakeholders.

Data contained within this report covers our activities throughout the 2022 calendar year unless otherwise noted, with some activities covered up to December 2023, including those undertaken at our headquarters and R&D facilities in Japan, at our polymer production plant in Thailand, and through our strategic partnership in the USA.

Read our latest disclosures in accordance with the GRI standards [here](#).



Impact = Innovation + Integrity

Impact

IMPACT= INNOVATION+ INTEGRITY

Our commitment

We strive to play our part in helping society shift towards adopting better materials by continuing to hone our understanding and use of proteins. In order to bring about this change, we are committed to further scaling up the production of our fibers to provide alternative, sustainable textile materials to customers globally.

We believe we can maximize our positive impact on the environment and society by expanding our capacity to produce these materials so that they can be adopted across a variety of industries.



Our progress

Improve productivity

After successful production trials, we are now on the way to large-scale mass production in Thailand with a capacity of up to 500 tonnes of Brewed Protein™ polymer per year.

We are continuing to increase production in Thailand and will continue to improve our process while preparing to expand capacity at a second production plant in the USA in order to reach a wider market.

Develop various formats of Brewed Protein™

Other than fibers used for yarn spinning, we are also pursuing material science innovations to further diversify the performance attributes of our polymer to expand its range of applications and adoption.

One example of this can be seen in our active efforts in the alternative protein space, where we develop various formats of Brewed Protein™ materials to be used as functional ingredients that replace animal-sourced ingredients and foods. In addition to this, we are proactively developing animal fur alternatives to expand our range of textile products.

In 2022, Spiber participated in a project to compile a comprehensive database of spider silk protein gene sequences and their associated physical properties as fibers. The project was promoted by an international joint research group led by Professor Kazuharu Arakawa (Institute for Advanced Biosciences, Keio University) and Professor Keiji Numata (Biopolymer Research Team, RIKEN Center for Sustainable Resource Science/Department of Material Chemistry, Kyoto University). The analysis of obtained amino acid sequence information and physical properties from 1,098 species of spiders was used by researchers to investigate both the types of proteins that constitute spider silk as well as the effects of protein motifs on the physical properties of silk fibers. Read more about the project [here](#).

A word from GOLDWIN INC.

"GOLDWIN has been collaborating with Spiber since 2015 to develop structural protein materials for use in apparel products. Our shared goal has been to address various environmental challenges within the apparel industry. To this end, we have closely monitored the evolution of Brewed Protein™ materials throughout our partnership. In 2023, eight years after the inception of our collaboration, Spiber achieved mass production of Brewed Protein™ polymers, and we successfully launched several [global commercial-scale collections](#) featuring these materials.

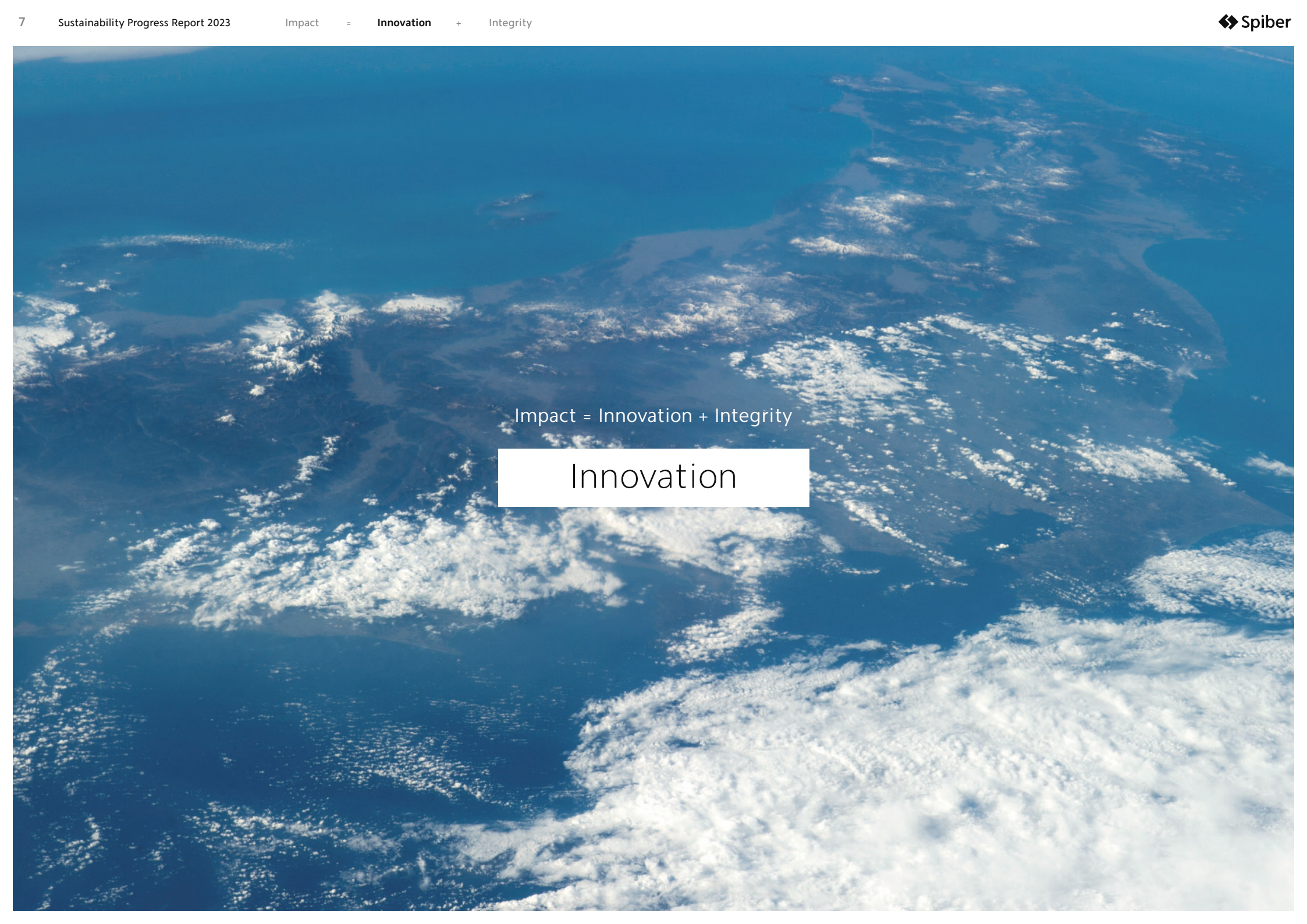
We firmly believe that Brewed Protein™ materials have the potential to revolutionize a wide range of industries, including fashion. Implementing new materials into high added-value textiles and garments that truly satisfy consumers is a significant challenge, but we remain enthusiastic about our continued joint development efforts. Our motivation is to make these innovative materials accessible not only to our company but also to the global community. We look forward to continuing our collaborative journey in the years to come."

GOLDWIN



Takao Watanabe

President & Representative Director,
GOLDWIN INC.



Impact = Innovation + Integrity

Innovation

IMPACT = INNOVATION + INTEGRITY

Innovation

Our vision is to expand the range of sustainable materials through our technological innovation, closed loop systems, and key partnerships.

Innovation is the beating heart of our business. We are committed to continuing the development of Brewed Protein™ materials and providing compelling, sustainable solutions for a wider range of industries. Given that innovation is not possible without the talented people who drive our business, we are firmly committed to helping our team thrive and reach their full potential during their time at Spiber.

Brewed Protein™



Our commitments

1. Circularity

Publish the first version of our design guideline for [biosphere circular products](#) by the end of 2023

3. Diversity, Equity, and Inclusion in the workplace

Form an official Diversity, Equity, and Inclusion (DE&I) committee led by senior management and define activities to promote the diversity of Spiber's workforce by 2024

1. Provide DE&I training to raise awareness and help create a more inclusive culture
2. Introduce a program for employees with disabilities to ensure equity of access to recruitment, career development, promotion, training, and other employment opportunities for all staff
3. Introduce DE&I considerations to the recruitment process
4. Bring the ratio of women in management positions (senior manager level and above) at the Spiber Group to at least 30%² by 2025

2. Greenhouse gas emissions and energy

Create a mitigation plan by 2024 to reduce emissions intensity to 10 kg CO₂ equivalent per kilogram Brewed Protein™ fiber by 2029¹

4. Sourcing

Identify potential non-edible feedstocks

1. Develop processes to utilize various types of agricultural waste and by-products as feedstock
2. Replace at least 50 tonnes (dry weight) of sugarcane sugar with non-edible, biomass-based sugar as feedstock annually for Brewed Protein™ polymer production in Thailand by 2026

¹ Details concerning our Scope 1 and 2 greenhouse gas (GHG) emissions and further information on our reduction activities can be found in our Sustainability Impact Report from page 34 onward.

² Current ratio of women in management positions (senior manager level and above) within the Spiber Group is 11% as of November 2023.

1. Circularity

Our commitment

Publish the first version of our design guideline for biosphere circular products by the end of 2023

Our progress

We showcased our biosphere circulation project at the Biofabricate Paris Summit 2024 where we shared our vision for what we believe is necessary to achieve a circularity-based society. In parallel, we published our biosphere circulation project principles, a set of guidelines which facilitate the design of products that can be converted into nutrients for microbial fermentation at end-of-use, therefore ensuring compatibility with biosphere circulation.



2. Greenhouse gas emissions and energy

Our commitment

Create a mitigation plan by 2024 to reduce emissions intensity to 10 kg CO₂e equivalent per kilogram Brewed Protein™ fiber by 2029

Our progress

We have created dedicated internal working groups to identify the steps necessary to achieve 10 kg CO₂e GHG emissions per kilogram of Brewed Protein™ fiber. These groups seek to ensure that input from our environmental sustainability members is reflected in Spiber's production, engineering, R&D, and supply chain management functions. These working groups focus on emissions reduction within different areas of our production process and our upstream supply chain. For example, the working group focusing on polymer production is looking at detailed energy management at the current Thai polymer plant to reduce energy use, and is also performing feasibility studies on alternative energy options that could enable Net Zero emissions for on-site operations.

Through disclosures like the Carbon Disclosure Project (CDP), we are refining our thinking on how to measure and reduce our impacts to reach our goal of achieving Net Zero by 2035.



3. Diversity, Equity, and Inclusion in the workplace

Our commitments

Form an official Diversity, Equity, and Inclusion (DE&I) committee led by senior management and define activities to promote the diversity of Spiber's workforce by 2024

1. Provide DE&I training to raise awareness and help create a more inclusive culture
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Our progress

We have a participatory approach in which DE&I topics are considered by employees and brought to upper management. Spiber's DE&I Working Group consists of team members from various backgrounds who gather voluntarily on a regular basis to voice opinions, identify issues, and offer help and feedback for projects undertaken by the DE&I Team. The DE&I Team Manager is a regular attendee in upper management meetings (at the division and executive office level), where they represent DE&I perspectives and audit the management cadre's decision making with a DE&I lens.

DE&I Working Group

In early 2022, a group of employees initiated the "DE&I Working Group", an internal community passionate about participating in DE&I discussions, which was the precursor to the later-formed DE&I Team, established under our Human Resources Section in June 2023.

Diversity seminar

The team conducted its first DE&I Lecture as part of Spiber's biannual company-wide information sessions, with DE&I-related content being reflected in the existing harassment prevention seminar, introducing example cases of LGBTQ+ and racial discrimination at work, and promoting the importance of providing support for non-Japanese speakers at Spiber.

Improvement of hiring procedures

Spiber plans to start implementing DE&I in our hiring process by posting policies on DE&I hiring procedures on our website and making necessary changes to job descriptions and candidate screening approaches.

New Healthcare Leave allowance

In 2023, the DE&I Team proposed and initiated a new paid Healthcare Leave allowance, which provides 12 days of additional paid leave per year to menstruating individuals. The team is currently working towards eventually expanding the allowance's scope to serve as sick leave for all individuals.

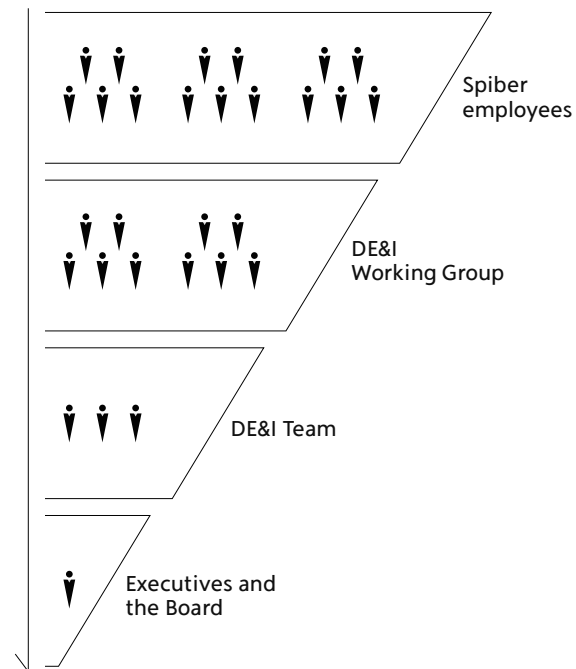
"Job Coach" certification

Before the initiation of the DE&I Team, two Working Group members acquired the Japanese "Job Coach" certification to provide professional assistance and training for employees with special needs.

Equity

The team conducted the first company-wide DE&I survey, revealing a significant perception gap on a number of issues between male and female employees. This result has prompted a goal to increase the ratio of women in senior management positions to 30% by 2025. Despite women constituting 40% of Spiber's workforce, the current ratio of women in senior manager positions and above is only 11%.

Our participatory approach to DE&I



A word from DE&I Team Manager

"In Japan, new laws and regulations surrounding diversity, equity, and inclusion are now being adopted and enforced—however, in reality, the concept of DE&I seems still relatively new to many Japanese companies. Spiber is a company with offices worldwide and with 10% of the headcount in the Japan head office coming from overseas. As a company that is dedicated to realizing sustainable well-being through material innovation, it is only natural that we begin strengthening our focus on DE&I. Since this represents a different area from our core R&D activities which we have been dedicated to for over 15 years,

one of the DE&I Team's major tasks is to foster internal understanding and raise awareness levels of these issues throughout the company. To achieve this, we prioritize gathering information, deepening our knowledge, and undergoing internal and external assessments. We are currently reaching out to employees in need of DE&I support while working on specific projects such as B Corp certification, increasing female leadership, and hiring individuals with special needs. We intend to proceed rapidly but with a careful and thoughtful approach, valuing opportunities for internal dialogue."



Chisa Uehara
DE&I Team Manager,
Spiber Inc.

4. Sourcing

Our commitments

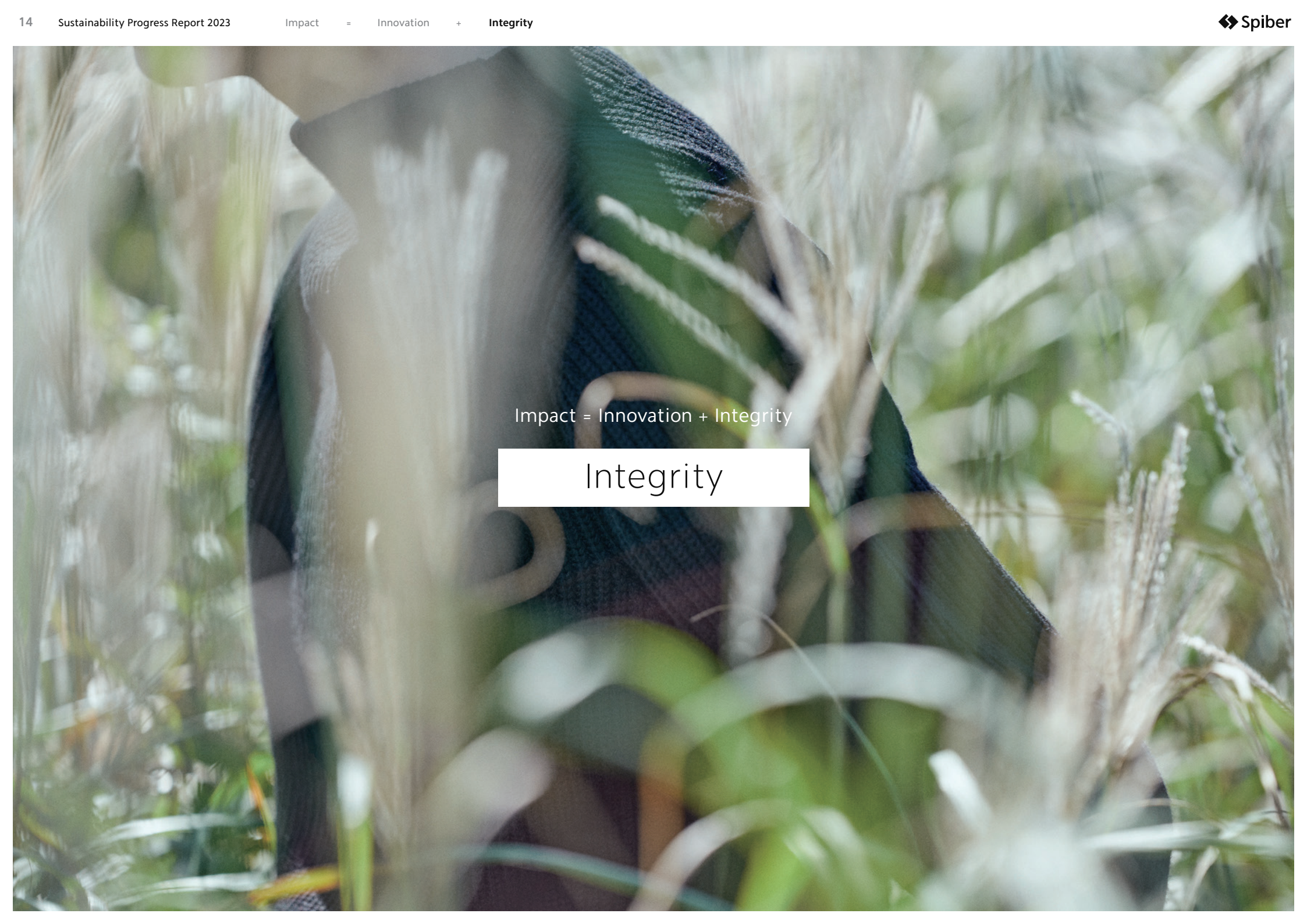
Identify potential non-edible feedstocks

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2. Replace at least 50 tonnes (dry weight) of sugarcane sugar with non-edible, biomass-based sugar as feedstock annually for Brewed Protein™ polymer production in Thailand by 2026

Our progress

In addition to textile waste, we have also been conducting trials on the use of bagasse-based sugars as feedstock for our mass production process in Thailand. We have seen promising results in these trials and are working on optimization of the process to enhance output quality.



A person is shown from the chest up, wearing a dark green, textured Spiber garment. They are standing in a field of tall, dry grasses. The image is slightly blurred, giving it a natural, organic feel.

Impact = Innovation + Integrity

Integrity

IMPACT = INNOVATION + INTEGRITY

Integrity

We strive to ensure that our values are embedded in the way we operate our business and the approaches we take when sourcing our raw materials.



Our commitments

1. Greenhouse gas emissions and energy

Measure and disclose our carbon footprint, including both direct emissions and those from our supply chain

1. Use 100% renewable electricity through direct use and support for construction of new facilities for renewable electricity generation aiming for 2025, and at the latest by 2027

2. Sourcing

Define and identify strategy to source sustainable materials

1. Increase number of suppliers that adhere to our Sustainable Sourcing Policy
2. Increase traceability within our supply chains
3. Implement methods and activities to reduce social and environmental impact within our supply chains
4. Identify risks within supply chains through Human Rights Impact Assessment (HRIA) by Q2 2023
5. Implement and communicate an anonymous grievance mechanism that can be used by all stakeholders

1. Greenhouse gas emissions and energy

Our commitment

Measure and disclose our carbon footprint, including both direct emissions and those from our supply chain

1. Use 100% renewable electricity through direct use and support for construction of new facilities for renewable electricity generation aiming for 2025, and at the latest by 2027

Our progress

We made our first voluntary submission to the Carbon Disclosure Project in 2023 for our 2022 activities. See our GRI index for details on our direct emissions (Scope³ 1 and 2) for the year 2022. We plan to continue submitting our information to CDP annually, including at least four categories of Scope 3 from our 2023 activities.

We are continuing to monitor opportunities for renewable energy procurement with additionality in the countries in which we operate.

Renewable energy

In the meantime, since the beginning of 2023 we have started procuring renewable energy certificates in equal amounts to our electricity usage in Japan and Thailand. While we are aware that certificates, given their over-supply relative to demand, can have limited direct impact⁴ on the world, we do believe that this is a way that we can signal our demand to renewable electricity developers in Japan and Thailand.

As we engage with our supply chain in a rally for action on these issues, it is crucial that we first take action ourselves. Moving forward, we hope to continue to improve the quality of the renewable electricity we are purchasing while making use of the options we have today.

³Scope 1 emissions are emissions directly from our operations.

Scope 2 emissions are indirect emissions from the generation of energy we buy, i.e., the electricity we purchase.

Scope 3 emissions are indirect emissions from our value chain.

⁴Spiber is currently purchasing unbundled environmental attribute certificates (iRECs in Thailand and non-fossil fuel certificates with tracking in Japan).

We acknowledge that use of such unbundled credits is not the most direct path to drive global reduction of greenhouse gasses ([source](#)), and we are actively following developments related to renewable energy procurement options with the intention to identify and transition to more impactful sources of renewable electricity in the future.



2. Sourcing

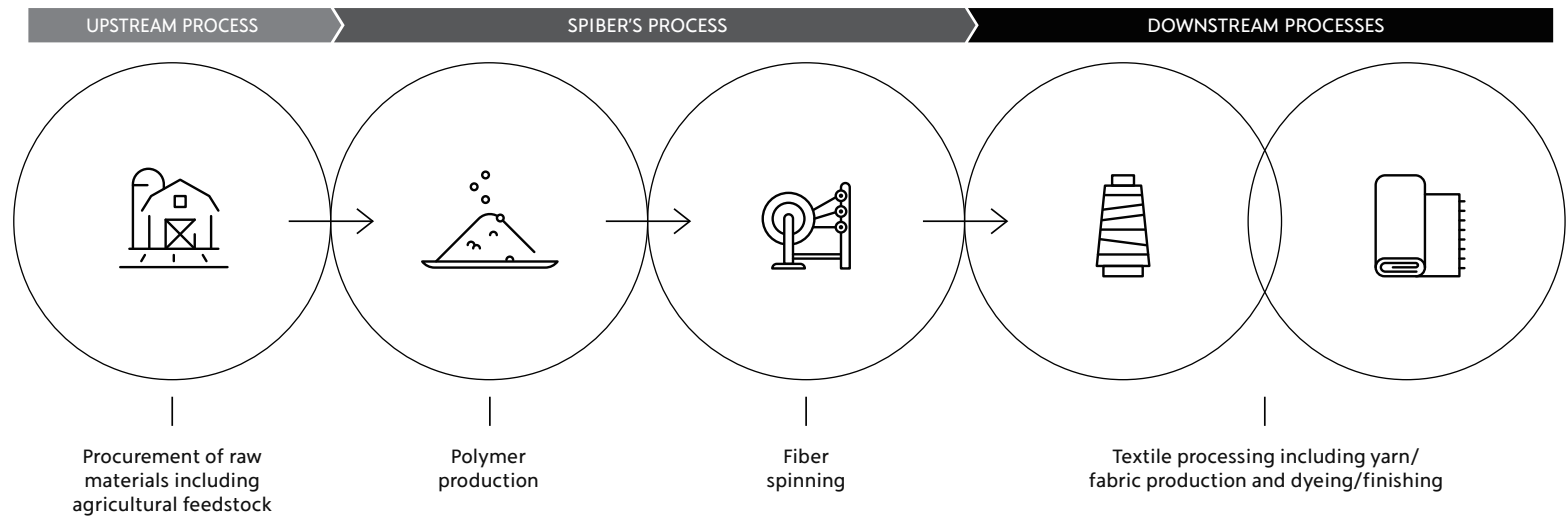
Our commitment

Define and identify strategy to source sustainable materials

1. Increase number of suppliers that adhere to our Sustainable Sourcing Policy

Our progress

More than 80% of our upstream suppliers for our plant in Thailand have signed our Sustainable Sourcing Policy. Collecting signatures for our policy is an ongoing effort as it requires a balancing of interests for some of our suppliers, but we are determined to continue working towards this goal.



Our commitments

2. Increase traceability within our supply chains
3. Implement methods and activities to reduce social and environmental impact within our supply chains
4. Identify risks within supply chains through Human Rights Impact Assessment (HRIA) by Q2 2023
5. Implement and communicate an anonymous grievance mechanism that can be used by all stakeholders

Our progress

Importance of traceability

We are collecting data from our downstream supply chain—i.e. the textile processing, yarn, and fabric companies that we work with—to develop yarn and fabric products. We are beginning to make this information accessible to our customers in the form of product pages with key traceability information such as the names and locations of our suppliers and the various physical and chemical inputs that go into making our products (see an example [here](#)).

We recognize the importance of traceable supply chains and transparent disclosure in order to determine the negative and positive impact of our products within the value chain and their handling at the end-of-use stage.

We are glad to see policy in European countries shifting towards making collection and communication of product manufacturing data mandatory for retailers and brands in the apparel and textile industry. We aim to encourage our supply chain to prepare for these changes by having increased dialogue with our suppliers in order to disseminate the importance of traceability.

Screening-level Human Rights Impact Assessment

We conducted a screening-level Human Rights Impact Assessment which consisted of screening geographies and industries represented in our upstream supply chain using a number of intergovernmental and NGO-operated human rights risk databases and expert consultation.

We recognize that our sugar supply chain in Thailand is a relatively high risk-prone portion of our supply chain as compared to other raw materials that we source.

We are now engaging with our key suppliers to identify and further understand our salient human rights risks in order to mitigate the issues within our supply chain going forward.

We are now a [Bonsucro Chain of Custody](#) certified company, providing assurance that our sugarcane-related sustainability claims can be tracked along the supply chain, from end to origin. In addition, the sugar we procure for our fermentation process in Thailand is from a Bonsucro-certified sugar mill.

Anonymous grievance mechanism system “SpeakUp”

To increase direct engagement with our supply chain, we recently implemented an anonymous grievance mechanism system called [SpeakUp](#). This service can be used by all stakeholders in our supply chain, including workers in our upstream supply chain and communities living around production sites.

We also facilitated training sessions with relevant employees who will help with issue resolution with workers or other stakeholders who report grievances using this mechanism. Through this approach, we were able to better understand the accountable authorities for various issues and create scenarios to help determine grievance redressal.

A word from Bonsucro

"For the past three years Bonsucro has learned a lot about the promising role of sugarcane in innovative solutions to the textile sector. This is quite a new market and like other biomaterial sectors, an important opportunity for replacing fossil-based materials and for value creation in agricultural supply chains. Nonetheless, it is critical that new biomaterials are made with sustainably produced crops, promoting best social and environmental practices.

Spiber has been a Bonsucro member since 2020 and their team has worked to implement Bonsucro's Code of Conduct and to achieve Bonsucro Chain of Custody Certification, effectively becoming the first Bonsucro certified company in the textile and apparel industry and opening the door for the use of sustainably sourced sugarcane materials in clothing through products made with Brewed Protein™ material.

We are very excited about this new market for Bonsucro certified sugarcane and congratulate Spiber's team for their commitment and leadership."



Furusato Nozei (Hometown Tax)

In 2022, Spiber participated in the Furusato Nozei ("Hometown Tax") program through which the city of Tsuruoka (where Spiber's headquarter is located) offered T-shirts that contain Spiber's Brewed Protein™ fiber to Japanese taxpayers in return for donations, with a promise to use one-third of the donation revenues towards the development of child-oriented services and infrastructure in Tsuruoka.

We also shared traceability information about point of origin, processing, and other production steps for consumers to access via a scannable QR code.

This product is designed to showcase our commitment to a sustainable, circular economy and to contribute to building better infrastructure for future generations.

Read more about the project [here](#).



