CORPORATE SOCIAL RESPONSIBILITY REPORT

2023-2024

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We are delighted to present our annual Corporate Social Responsibility (CSR) report, a reflection of our steadfast commitment to making a positive impact on the communities we serve and the world we inhabit. This report offers a comprehensive overview of the initiatives, achievements, and challenges we have encountered over the past years as part of our CSR efforts. As a responsible corporate organisation, we believe in contributing to social and environmental well-being and continually aspire to align our business operations with sustainable practices. In this report, we will share our accomplishments, partnerships, and the meaningful changes we have implemented, underscoring our dedication to creating a better, more responsible future for all.

CONTENTS

OUR SUSTAINABILITY GOALS

Beyond Business as Usual : Empowering Change, Driving Innovation and Redefining Corporate Social Responsibility and Sustainability at Oat Cosmetics

At Oat Cosmetics, we firmly believe that businesses have a responsibility to give back and support the communities and the environment within which they operate while providing the highest quality products. As a consequence, we want to ensure that the values that we hold as a company are reflective of our beliefs as well as the multidimensional nature of our responsibilities. Thus, we adopted the core values of Quality, Sustainability and Traceability, which we continuously strive to commit to. Furthermore, as a company we recognise that Sustainability is a highly extensive area which requires a systematic approach. Hence we adopted the focus of People, Profit and Planet to better reflect our sustainability initiatives as well as guide us in our sustainability commitments to ensure we leave no stone unturned when it comes to contributing to a greener and brighter future at Oat Cosmetics.

Furthermore, we recognise the importance of the UN Sustainable Development Goals (SDGs) and ensuring our actions are a reflection of them. The goal we selected as being most closely aligned with us, is the SDG of Responsible Consumption and Production. By recognising this alignment, it has helped us to shape our commitment as well as to ensure our accountability and responsibility towards our actions and their impacts. Furthermore, we aim to always improve upon previous years whenever possible.

OUR FOCUS

We understand Sustainability requires a multifaceted approach, which is why we explore the three concepts of People, Profit and Planet throughout this report.

Agricultural sustainability is a complex concept that not only proves challenging to define but also poses difficulties in its implementation and measurement (Hayati, Ranjbar and Karami, 2010). Additionally, it is widely acknowledged that sustainable agriculture should encompass ecological, economic, and social aspects (Ibid.). As stated by Neher (1992), a sustainable agricultural system must demonstrate ecological sustainability to persist in the long run, ensuring the preservation of natural resources and minimising environmental impacts (Altieri, 1987 & Ikerd, 1990 as cited in Neher, 1992). At the same time, it must also remain economically viable and profitable over time, ensuring the economic sustainability of the system (Stenholm and Waggoner, 1990 as cited in Neher, 1992).

In line with this understanding, we have chosen to adopt a framework as part of our value of Sustainability, which embraces the principles of People, Profit, and Planet. This approach aligns with the widely used 'triple bottom line' concept, which emphasises the interconnectedness of social, environmental, and economic considerations in business practices (Elkington, 1997 as cited in Aldaya et al., 2011). By incorporating these three dimensions, we strive to address the multifaceted nature of sustainability.

In focusing on People, Profit, and Planet, we also aim to foster sustainable practices that not only protect the environment and preserve resources but also contribute to the well-being of individuals and communities, such as through charitable donations. This inclusive approach allows us to consider the diverse dimensions of sustainability and work towards improving each dimension within our business practices. Most importantly, we want to shift towards promoting and implementing an altruistic and far-sighted economy which optimises resource use and helps to maintain the delicate equilibrium that we must maintain with the ecosystem for future generations (Agovino et al., 2019).

PEOPLE, PROFIT, PLANET

To enhance the readability and clarity of our sustainability report, we have implemented a colour coding system to highlight the key areas of focus: People, Profit, and Planet. Each section will be marked with a distinct colour. This colour coding system aims to provide a visual guide, making it easier for readers to identify and navigate through the report, ensuring a comprehensive understanding of our commitment to sustainable practices across all aspects of our business.

PEOPLE

COMMUNITY ENGAGEMENT
EMPLOYEE EMPOWERMENT
WORKPLACE ENVIRONMENT

PROFIT

CHARITABLE GIVING
EU-CENTRIC OPERATIONS
OAT RESEARCH PROJECTS

PLANET

SUPPLIER PRACTICES
GREEN CHEMISTRY PRINCIPLES
PACKAGING & TRANSPORT EVALUATION
BIODEGRADABILITY MEASUREMENT

CERTIFICATIONS

While only a small company, we prioritise ensuring the Quality, Sustainability and Traceability of our products. This is why we endeavour to obtain and maintain certifications.

ECOCERT 'Natural' according to COSMOS standards

A certificate of compliance with the scheme of ECOCERT Greenlife Natural and organic cosmetics.

ISO 9001:2015

Certification of our research, development and supply efforts of natural ingredients for cosmetic and pharmaceutical formulators and food manufacturers.

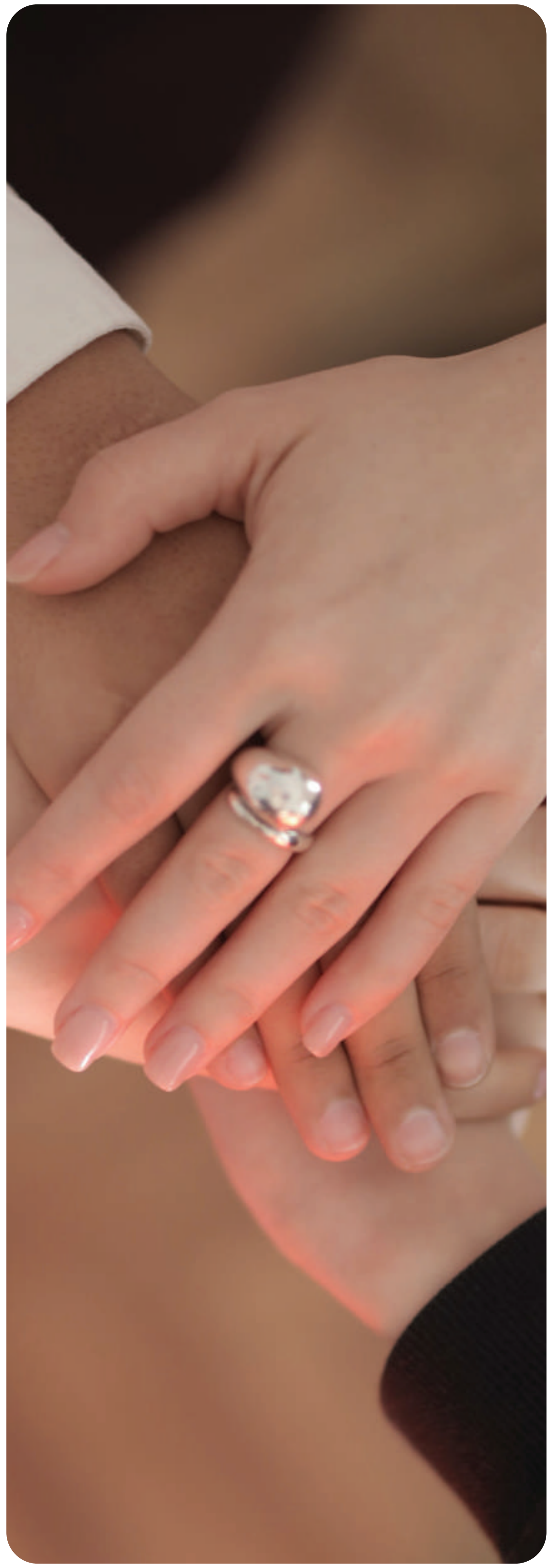
ECOVADIS Bronze

A certificate of achievement in the Ecovadis Sustainability Rating.

No Animal Testing

We do not support testing on animals for any purpose, and do not carry out or commission such tests on our products or the additional ingredients they contain. Our own ingredients have never been tested on animals and we operate a fixed cut-off date for animal testing of any co-ingredients used as of 31 December 2007.

COMMUNITY ENGAGEMENT



This section of the report demonstrates our commitment to social responsibility and community engagement through our charitable donations. We believe in actively supporting causes that align with our sustainability goals and initiatives and that have a lasting impact on our community and the environment around us.

2022-23 **£8,375**

Charities

Yellow Door
GOSH
Oakhaven
Salisbury Hospice
RMHC
Sophie's Legacy

2021-22 **£6,625**

Charities

WWF
Ukraine Humanitarian Appeal
Youth in Romsey

2020-21 **£5,760**

Charities

Team Scrubbers
WWF
Mind

2019-20 **£5,610**

Charities

Chron's and Colitis
World Land Trust
Mission Christmas
British Skin Foundation
National Emergency Trust
Naomi House
National Trust

THANK YOU

"Wow that is absolutely incredible. I want to thank you sincerely for your generous donation to Sophie's Legacy. We are truly grateful for your kindness and support."

SOPHIE'S LEGACY

"It's very kind of you to select Yellow Door to support. We really appreciate it. We know that the cost of living is having a huge impact on our clients of all ages and backgrounds and the service. Donations like these make such a difference to us."

YELLOW DOOR

"Thank you so much for your generous donation. Your kind gift helps Great Ormond Street Hospital give seriously ill children the chance of a better future. Please pass on our sincere thanks to everyone, GOSH wouldn't be the extraordinary place it is without the generosity of people like you."these make such a difference to us."

GREAT ORMOND STREET HOSPITAL

"A massive thank you for choosing us as your charity to support in this way. Provision of this service is only made possible by the sustained and generous donations we receive from kind people and businesses such as yourself. You can be assured that your donation will be put to excellent use supporting the palliative care services that help so many in our community."

SALISBURY HOSPICE

"We're thrilled to hear that your team would like to make a donation to Ronald McDonald House Charities UK. Please pass our sincere gratitude to everyone, it will help us make a big different to families of children in Hospital."

RONALD MCDONALD HOUSE

THE TEAM

Empowering Our Workforce for Sustainability: Nurturing our people through equal opportunities and professional development

At Oat Cosmetics, we recognise the pivotal role our employees play in our success. As an equal-opportunities employer, we are committed to finding, supporting, and developing exceptional individuals who work alongside us. We foster a collegiate and professional working environment where clear accountability is paramount, and every employee understands the value they bring to the company's achievements.

Employee Development and Empowerment:
We believe in providing our employees with ample opportunities to grow and excel within their roles. Through internships,professional development programs and ongoing training initiatives, we support our colleagues' personal and professional growth. Our goal is to create an environment where each employee feels empowered to take ownership of their work,contribute to the company's success, and make a positive impact on our journey towards sustainability.

Workplace Satisfaction and Engagement:
We are committed to ensuring that all our colleagues enjoy their work and have opportunities to become more empowered within their roles. We promote a culture of open communication and collaboration, encouraging employees to share their ideas and perspectives. By fostering a sense of shared responsibility, we empower our team members to contribute to the company's continuous improvement and drive us towards greater success.

Personal Development Plans:
To support our employees' growth, we conduct two review meetings per year as part of our staff Personal Development Plans. These meetings serve as a platform for employees to engage in meaningful dialogues with Oat Cosmetics' management, discussing all aspects of their personal development. We encourage employees to explore opportunities for further support through external learning, web-based education, or other types of relevant courses. Oat Cosmetics is dedicated to supporting the cost of any agreed-upon courses, ensuring that our employees have the necessary resources to pursue their professional aspirations and expand their skill sets.

Modern Slavery Declaration

Slavery and forced labour can take many forms, including human trafficking or child labour.

It is a crime and a violation of fundamental human rights. Oat Services is committed to ensuring that there is no modern slavery or human trafficking in our supply chains or any aspect of our business activities.

Our Anti-slavery policy reflects our commitment to acting ethically and with integrity in all our business relationships and to implementing and enforcing effective systems and controls to ensure slavery and human trafficking is not taking place within our supply chains.

We have zero tolerance to slavery and human trafficking and require our suppliers and distributors to conduct their business in a manner which is consistent with our code of ethics.

Oat Cosmetics

05 September 2023

PROFITABILITY

Profit for Purpose: Leveraging Financial Success for Sustainable Impact

Charitable Giving

At Oat Services, we firmly believe that profitability and sustainability go hand in hand. As part of our sustainable business practices, every year we allocate a percentage of our profits to support charitable purposes and invest in projects that harness the full potential of oats. Our total donation is calculated based on our net declared profit, utilising a progressive scale that ensures our giving aligns with our financial success. As per our Social Corporate Responsibility (CSR) policy, total charitable giving will be calculated on the following basis:

Net declared profit	Donation
£100,000 to £250,000	1.0%
£250,001 to £400,000	1.5%
£400,001 and above	2.0%

This commitment to financial giving underscores our belief in leveraging our profitability to make a meaningful and positive impact on society. We recognise that our success is interconnected with the well-being of ourcommunities and the environment. By directing a portion of our profits towards charitable causes, we actively contribute to sustainable development and create lasting benefits for those in need.

Harnessing the Potential of Oats

In addition to our charitable giving, we have engaged in projects such as the OATEC and ABIPO initiatives. In collaboration with various partners, the OATEC project focused on exploring the use of oats in non-food markets, aiming to develop innovative processes and products. The ABIPO project, on the other hand, aimed to unlock the power of oat antioxidants in the personal care industry. By studying the performance of oat oil and constituent oat antioxidants in personal care and health products, we sought to provide new, non-food markets for oat growers. This project involved optimising processing and extraction methods, assessing the potential of oat fractions in personal care products and converting starch-rich waste into valuable products.

By actively participating in these projects, we not only contribute to sustainable development but also harness the potential of oats beyond the food industry.

EU-Centric Operations

Our charitable donations and project involvement are complemented by our EU-centric operations, with a significant presence in the Nordic region as we prioritise the stability and resilience of our supply chains. This strategic approach allows us to maintain greater control over our processes and ensure the uninterrupted delivery of our high-quality products, even in the face of challenges such as Brexit (See our Brexit Statement for further details). Our EU-centric operations not only enable us to navigate the complexities of Brexit but also reinforce our dedication to sustainability and environmental responsibility. The Nordic countries are known for having an exceptionally strong regulatory environment for agriculture as well as high standards for sustainability practices, making a Nordic focused presence highly beneficial in furthering our sustainability objectives.

Brexit Statement

16th November 2023

From January 1st, 2021, new arrangements will come into force for goods travelling between the UK and the EU.

This may not affect the majority of sales of our products as manufacture taken place in Europe, so where orders are for pallet loads etc, goods will be shipped direct from the manufacturing plants.

Our only challenge may surround Oat Lipid e which enters the UK for further refining before being finished in the Netherlands. It is possible these will be included in transit arrangements for goods originating in the EU and then re-exported by the UK.

Smaller quantities are currently packaged by Oat Services Ltd in the UK. We will continue to monitor the regulations however as this is EU produced material which is unchanged, tariff relief may be available. Currently, there are no clear regulations regarding goods for this nature.

Further updates will be sent as appropriate.

James Daybell

CEO

PROJECTS

Driving Sustainability through Innovative Projects.

In this section, we highlight the notable projects undertaken by our company that demonstrate our commitment to sustainability. Through these projects, we aim to drive positive change, foster innovation, and encourage collaboration in the pursuit of our shared vision for a greener future.

OATEC

New technology for new markets

OATEC was a feasibility study conducted to explore the use of oats in non-food markets. The project, divided into two phases, focused on advanced fractionation technology to manufacture oat intermediates at sustainable prices. Key markers for phase one included assessing the feasibility of constructing a plant, identifying potential markets for oat products and analysing the compositional profiles of UK-grown winter sown oats. The project was managed by the Project Management Group (PMG) and involved collaboration with various organisations in the industry. Phase two of the project specifically focused on researching the market potential, technology needs and financial validity of an oat fractionation plant in the Marches area within the UK.

OATEC played a crucial role in expanding the utilisation of oats beyond traditional food applications and raising the profile of oats for the UK and the Marches area through the achievement of world recognition as having core expertise in oat fractionation. The collaboration with various organisations demonstrated a shared commitment to sustainable agriculture and the development of value-added oat products. Furthermore, OATEC's findings and advancements in oat processing stimulated strong commercial interest and activity in the furthering of research and development of oat actives, demonstrating its achievement as being a highly valuable project.

ABIPO

Unlocking the power of oat antioxidants in the personal care industry

ABIPO aimed to improve the utilisation and value of oat antioxidants and oil in the personal and healthcare industries to open new non-food markets for oat growers within the UK. The project focused on studying and optimising extraction technologies, assessing the potential of oat fractions, converting starch-rich waste streams into value-added products and exploring oat varieties that maximise the biosynthesis of phenolic compounds. Further scientific and technical objectives included measuring the concentration of antioxidants and exploring the natural arrangement of oat oil within the grain.

By investigating the performance and applications of oat oil and antioxidants, the project assisted the UK in developing a level of knowledge and expertise in the area of advanced oat fractionation that is unparalleled in Europe or the US. This knowledge thus contributed to the formation of invaluable insights and information that helped to further our sustainability initiatives. Such insights included the bio-conversion of oat-waste stream material by fungi into value added products.

These projects exemplify our dedication to research, innovation and collaboration to explore new markets, enhance the value of oats and promote sustainability across various sectors. By harnessing the unique properties of oats and driving advancements in processing and utilisation, we strive to contribute to maximising the potential usages of oats and all its by products through the usage of efficient and sustainable practices.

OATS

Bridging the Gap: Assessing the Environmental Impacts of Oats in 2023 and Beyond

WATER CONSUMPTION

Agriculture accounts for a significant portion of global water consumption, amounting to approximately 70% of human water use (Bacon, 2004). This underscores the urgent need for water conservation efforts, which is why oats stand out as a favourable and relatively more sustainable crop choice. In comparison to water-demanding crops like almonds and cashews, oats require substantially less water (Mekonnen and Hoekstra, 2011). With a water requirement of just around 4kg per 100kg of oats produced, oat cultivation minimises the detrimental impact of long-term irrigation on vulnerable under ground aquifers (Bacon, 2004).

PROMOTING SOIL HEALTH AND REDUCING EROSION

Oats are known for their superior nutrient scavenging ability, thanks to their vigorous root systems (Ehlers, 1989 as cited in Canales, 2019). Compared to other crops, oats extract fewer nitrogen and other nutrients from the soil, reducing the need for excessive fertilisers. Thus, by adopting oats as a crop choice, we embrace a low-input approach that promotes sustainable nutrient usage, minimising surface and groundwater nitrate contamination (NAMA, 2015).

Furthermore, oat crops offer a natural defence against soil erosion. The dense cover provided by oats, coupled with their low water requirement, acts as a shield against erosion caused by wind and water. This protective effect helps preserve the integrity of our soils, preventing the loss of fertile top soil and safeguarding against erosion-related environmental degradation.

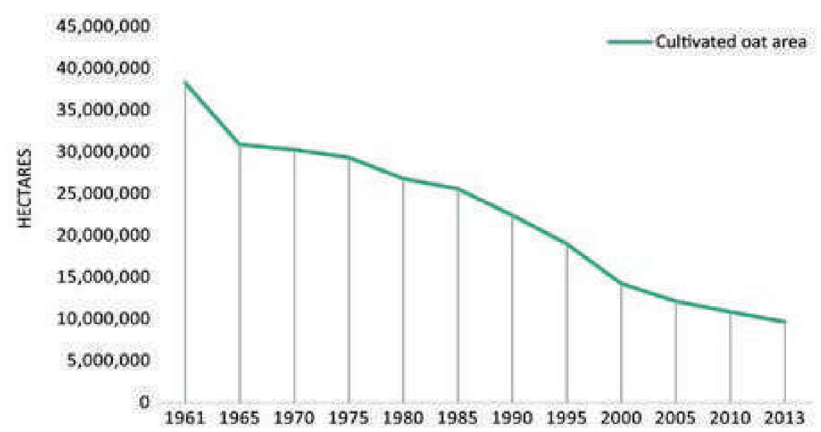
CROP SELECTION

Plant breeding of oats focuses on developing varieties with improved characteristics such as disease resistance, higher yield potential, reduced lodging, enhanced nutrient scavenging ability, and superior grain quality (Gorash et al., 2017). These breeding efforts have the potential to increase oat yields by approximately 0.41% annually (Hakala et al., 2020). However, the impact of climate change poses significant risks to oat production. Rising global temperatures beyond a 4^{0}C increase could lead to crop yield collapses, especially in regions such as Finland (Hakala et al., 2020).

Furthermore, pests contribute to substantial crop productivity losses, costing an estimated USD 220 billion in lost revenue globally (Chakraborty and Newton, 2011 as cited in Gorash et al., 2017). Unfortunately, oat production has seen a decline (see Figure 1), resulting in limited research efforts in oat breeding compared to other crops. To ensure the continued economic viability and efficiency of oat production, it is crucial to prioritise research into genetics, agronomy, technology, and plant breeding. This will promote the development of oat varieties that are more tolerant to heat, drought, and pests, enabling sustainable oat cultivation and addressing the challenges posed by climate change.

Figure 1:

Changes in World Oat Cultivated Area (Gorash et al., 2017)



OATS

GREENHOUSE GAS EMISSIONS (GHG)

Greenhouse gas emissions in crop production are an important consideration for sustainability. A study by González et al. (2011) compared the greenhouse gas emissions of various crops across different countries, providing valuable insights. According to their findings, swedish oats were found to have slightly higher total CO2 emissions compared to swedish wheat, rye,and barley. However, the CO2 emissions of swedish oats were lower than rice from Japan and the USA, maize from the USA, and wheat from the UK (see Table 1). The same study also examined protein content and delivery efficiency in cereals, as shown in Table 2. The table reveals that oats have a higher protein content (169 g protein/kg) compared to wheat, maize, barley, rye, and rice. Furthermore, oats demonstrate favourable protein delivery efficiency in terms of energy use and GHG emissions, with higher values for protein delivery per unit of energy (57 g protein/MJ) and per unit of GHG emissions (359 g protein/kgCO2eq.). Taken together, these findings highlight the environmental advantages of oats in terms of GHG emissions. Oats exhibit lower emissions compared to certain cereal crops and they boast higher protein content and delivery efficiency. These factors position oats as a more sustainable choice in the context of reducing greenhouse gas emissions and optimising protein production.

Furthermore, oat crops offer a natural defence against soil erosion. The dense cover provided by oats, coupled with their low water requirement, acts as a shield against erosion caused by wind and water. This protective effect helps preserve the integrity of our soils, preventing the loss of fertile top soil and safeguarding against erosion-related environmental degradation.

Table 1:
Energy use and GHG emissions in the production of 1 kg of food transported to the entry port of Gothenburg, Sweden as cited in González, et al (2011)

Food Type	Country of Origin	Energy Used (MJ/kg)	GHGs (kg CO2 eq./kg food)	Source
Cereals (1kg dry grain)	Wheat, Sweden	2.0	0.38	HM[a]
	Wheat, UK	2.9	0.83	(Williams et al., 2006)
	Wheat, USA	8.9	0.80	Energy: (Pimentel, 2009); GHG: HM[3]
	Wheat UK	1.7	0.29	(Brentrup et al., 2004)
	Barley, UK	2.8	0.76	(Williams et al., 2006)
	Barley, Sweden	2.6	0.43	HM[a]
	Rye, Sweden	2.1	0.36	HM[a]
	Oats, Sweden	2.9	0.47	HM[a]
	Maize, USA	6.1	0.73	HM[a]
	Maize, USA	6.0	0.58	Energy: (Pimentel, 2009); GHG: HM[3]
	Maize, USA	2.4	0.68	(Williams et al., 2006)
	Rice, USA	6.6	1.1	HM[a]
	Rice, USA	9.6	1.3	Energy: (Pimentel, 2009); GHG: HM[3]
	Rice, Japan	7.4	1.2	HM[a]

Table 2:
Protein content in selected foods, energy use, GHG emissions, and the protein delivery efficiency of these foods in terms of energy use and GHG emissions as cited in González, et al(2011)

Cereals	Protein content of food[a] (g protein/kg)	Energy Used[b] (MJ/kg)	GHG emissions[b] (kg CO_2 eq./kg)	Protein delivery efficiency energy (g protein/ MJ)	Protein delivery efficiency GHG (g protein/kg CO_2 eq.)
Wheat	111	3.9	0.58	29	192
Maize	94	4.8	0.67	19	141
Oats	169	3.0	0.47	57	359
Barley	111	2.7	0.60	41	187
Rye	103	2.1	0.36	48	283
Rice	66	7.9	1.2	8.4	56

a Nutrition data from USDA (2009).
b Average of values given in Table 1 for each food product.

OATS

CLIMATE CHANGE

Oats, as a resilient crop, offer several advantages in the face of climate change. Research studies have highlighted their ability to withstand flooding, showcasing higher resilience compared to other grains like barley (Hakala et al., 2020 as cited in Shrivastava, 2015). Moreover, oats exhibit greater resistance to early-season drought, making them well-suited for regions experiencing shifting precipitation patterns (Mukula and Rantanen, 1989 as cited in Shrivastava, 2015). In addition to their adaptability to challenging climatic conditions, oats thrive in acidic soils, particularly mull and peat soils common in northern regions (Sippola et al., 1989). This characteristic contributes to their successful cultivation in these areas, where other cereals may struggle.

Furthermore, oats possess a natural advantage in disease resistance compared to other grain crops. Thus, this may help mitigate the intensification of disease and pest pressures due to climate change (Mukula and Rantanen, 1989 as cited in Shrivastava, 2015). On a general level, the Scandinavian oat production industry exhibits a higher level of climate resilience compared to other regions, offering an advantage in the face of climate change. With reduced exposure to future drought and heatwave intensity and length, the Nordic region is better positioned to navigate climate impacts. In fact, certain aspects of climate change, such as extended growing seasons and increased rainfall, may even benefit oat production in the region (Shrivastava, 2015 as cited in Agovino etal., 2019). This adaptability to future climatic conditions, including increased winter-time moisture, early season temperatures, and precipitation patterns, further enhances the suitability of oats for sustainable cultivation.

Taking these findings into consideration, oats emerge as a resilient crop that can better adapt to future climatic conditions. Their unique characteristics and adaptability position them favourably in the face of climate change and provide an optimistic outlook for oat production within the Nordic region (Hakala etal., 2020).

FEEDSTOCK

Oats serve as a natural and renewable feedstock, offering remarkable sustainability and nutritional advantages. As one of the most sustainable crops worldwide, oats find extensive use in livestock farming. Oat by-products, such as straw and hulls, are commonly utilised as feed in exchange for receiving manure, creating a mutually beneficial cycle (Gorash et al., 2017). In addition, oats possess higher levels of crude fat compared to other cereal grains, providing livestock with a greater supply of calories and metabolisable energy (Gorash et al., 2017). Their superior amino acid profile and high fat content also give oats an advantage over wheat and barley as livestock feed (Gorashet al., 2017). According to Sippola et al. (1989), this valuable property of oats in feed mixtures also enhances the self-sufficiency in cattle farming in northern regions. Thus, by incorporating oats into feedstock, farmers can optimise resource utilisation, support animal health and contribute to a resilient and circular agricultural ecosystem, further emphasising the sustainable attributes of oat production (Gorash et al.,2017; Sippola et al., 1989).

DISEASE RESISTANCE

Oats exhibit remarkable resistance to various fungal diseases, resulting in reduced reliance on fungicides compared to other grains (Givens et al., 2004). Their inherent resistance to fungal infections, such as the soil-borne 'take-all' fungus (*Gaeumannomyces graminis*), positions oats as an effective "break" crop in cereal rotations, particularly for winter wheat (Chalmers et al., 1998 as citedin Gorash et al., 2017). This attribute not only contributes to sustainable disease management practices but also allows for the optimisation of fungicide usage in agricultural systems. The natural resilience of oats to fungal diseases highlights their potential as a sustainable choice in crop rotations and underscores their suitability for long-term agricultural sustainability.

OATS

Organically grown oats showcase elevated levels of antioxidants compared to conventionally grown oats, primarily due to the higher pest and disease pressure in organic crops caused by reduced pesticide usage, leading to increased plant stress. This stress triggers the synthesis of antioxidants as defence chemicals, bolstering their concentration in organic oats (Capouchová et al., 2020).

Several studies,including those by Zuchowski et al. (2011), Barański et al. (2014), and Zrcková et al. (2018), support the consensus that crops from organic farming generally exhibit higher concentrations of antioxidant compounds (as cited in Capouchová et al. 2020). Antioxidants play a pivotal role in the numerous positive health benefits associated with oats, including their topical application. However, it is noteworthy that beta-glucan levels, another significant components of oats, do not show consistent variations between organic and conventional cultivation methods.

A study by Saastamoinen et al. (2004) revealed significant variations in beta-glucan levels based on cultivation practices, year, and location of oat production. While organic cultivation may not consistently yield higher beta-glucan levels, the notable increase in antioxidant content contributes tothe overall health-promoting properties of organic oats. Moreover, it is important to highlight the significant presence of organic farming, particularly in Europe.

ORGANIC OATS (CONTINUED)

Although countries like Australia, China, and Argentina possess the largest organic areas in terms of land,the highest percentages of organic farming are found in Europe (Šrůtek and Urban, 2008) (See Table 3) .This emphasises Europe's leadership in promoting and adopting organic agricultural practices for sustainable food production.

Table 3:
Land under organic management and organic farms worldwide by continent as cited in Šrůtekand Urban (2008)

Continent	Organic Land Area (million ha)	Percentage of Organic Land Area	Number of Farms/percentage
Africa	1.2	3	118329/19
Asia	4.1	13	130000/21
Australia/Oceania	12.2	39	2662/0.5
Europe	6.5	21	167000/27
Latin America	6.4	20	193062/31
North America	1.4	4	12000/2
Total area/number	31.8		623053

See for details Willer H and Yussefi M (2006) *The World of Organic Agriculture: Statistics and Emerging Trends 2006*. Bonn (Germany): International Federation of Organic Agriculture Movements (IFOAM), and Frick (Switzerland): Research Institute of Organic Agriculture (FiBL).

OUR SUPPLIERS

We maintain transparent and ethical relationships with suppliers worldwide, prioritising sustainability practices throughout our supply chain to promote responsible sourcing and positive social-environmental impacts.

In the following sections, we delve into the sustainable practices of each supplier country. For more detailed information on specific product supplier regions, we encourage you to refer to the corresponding ingredient sustainability profiles. The majority of our suppliers are located in : **FINLAND AND SWEDEN**

At Oat Cosmetics, while the majority of our suppliers are based in the Nordic region, we also maintain partnerships with select suppliers in Canada and the UK. We recognise the importance of embracing our Nordic heritage and are eager to shift our focus more towards supporting local suppliers in Finland and Sweden, thus we will use Canada and the UK as points of comparison.

OUR NORDIC FOCUS

Sustainable advantages of Nordic suppliers.

IDEAL CLIMATE AND HIGHER YIELDS

The oat crop thrives in cooler, moister climates with acidic soils, making the Nordic region, characterised by year-round cool temperatures and high precipitation, an ideal climate for oat production. (Stevens et al., 2004). Furthermore, the future climate in Northern Europe is predicted to become milder and more humid towards 2050, further enhancing the favourable conditions for oat production in the region (Parikka et al., 2012). The beneficial Nordic climate, coupled with well-established infrastructure, dedicated plant breeding efforts, and advanced technology usage, all contribute to the exceptional oat yields in the region. Studies have shown that oat yields in the Nordics are approximately 30% higher than in North America, demonstrating the agricultural advantage of the Nordic climate (Mohar Singh et al.,2016). This higher yield potential is crucial for ensuring a robust oat supply and meeting the demand for oat-based products. Moreover, long-term crop yield trends provide valuable insights into the productive capacity of agricultural land and the ability of agriculture to sustain resource production capacity while managing production risks (Hayati et al., 2010).

COLLABORATION AND OAT BREEDING:

Within the broader context of why the Nordics offer exceptional advantages for oat production, a key factor lies in the innovative initiatives in oat breeding as well as remarkable levels of collaboration within the field. This has resulted in an acceleration in the development of superior oat cultivars. Examples of collaborative initiatives include the Public-Private Partnership (PPP) for Pre-Breeding which consists of renowned public research institutions as well as private plant breeding companies, including Boreal Plant Breeding (Finland), Graminor (Norway), and Lantmannen (Sweden) (Graminor, 2018 as cited in Nilsson etal., 2016). This collaboration broadens the genetic basis for oat breeding, facilitates the adaptation of oats to the Nordic climate, introduces specific genes for desired traits and explores new technologies to expedite the breeding process.

In Canada, there have been similar efforts to further cooperation, through the establishment of organisations including The Prairie Oat Growers Association (POGA) and The Sustainable Canadian Agricultural Partnership (Sustainable Cap) (Newfoundland & Labrador, 2023) as well as the adoption of strategies such as the Sustainable Agriculture Strategy (SAS) (Global Agricultural Information Network (GAIN), 2022).

OUR NORDIC FOCUS

In comparison with the UK, according to Donkersley et al. (2021), the agricultural cooperatives within the UK are significantly underdeveloped and sources of informal collaboration have declined over the past 40-50 years. Furthermore, voluntary schemes that have been set up to pursue the decarbonisation rates required to meet the agricultural emissions guidelines set by the UK Committee on Climate Change (CCC) have failed according to Donkersley et al (2021). This highlights the benefits of shifting production towards the Nordics due to the region's initiatives having gained recognition for their effectiveness and results.

ADVANCEMENTS IN PHENOTYPING TECHNIQUES

The Nordic Plant Phenotyping Network (NPPN) serves as a pivotal hub for plant phenotyping activities in the Nordics (Nilsson et al., 2016). By fostering stronger pre-competitive collaboration among research institutions, technology providers, and plant breeding companies, the NPPN facilitates information exchange, networking, and joint efforts in oat breeding (Ibid.). The network promotes the development and adoption of cutting-edge phenotyping techniques, enabling breeders to better evaluate oat cultivar traits, responses to climate variations and resilience to extreme weather events.

Furthermore, the European Research and Innovation of High-throughput Phenotyping in Field Trials (6PR&D) initiative plays a crucial role in oat breeding by developing non-destructive high-throughput field phenotyping methods. This innovative approach empowers breeders to utilise drones for regular and objective monitoring of breeding plots. By scoring characteristics using different wavelengths, which are beyond the human eye's capabilities, breeders can make informed decisions and select oat cultivars with superior traits, resilience, and optimised genetic gains (Nilsson et al., 2016). This ability is essential, because as suggested by Wiréhn (2018), the rise in extreme weather conditions and fluctuations as a result of climate change, could result in significant yield losses if effective actions are not taken to adapt accordingly.

SUSTAINABLE WATER USAGE:

Oat production in the Nordic region benefits from its lower susceptibility to drought, positioning it as a more sustainable choice in terms of water usage compared to many other regions.

Studies have shown that the average water footprint of cereal crops in Europe, including oats, is about three times smaller than in regions like Africa. This difference can be attributed to higher average yields in Europe, reaching 3.4 tons per hectare, compared to 1.3 tons per hectare in Africa.The higher yields in the Nordic region contribute to a more efficient use of water resources,resulting in a smaller water footprint per unit of production. (Mekonnen and Hoekstra, 2011)

Furthermore, research emphasises that the water footprint of a crop (refer to Table 4 for water footprint values of various crops), is influenced by agricultural management practices rather than the agro-climate alone, indicating an opportunity to improve water productivity and optimise resource utilisation. Thus, by leveraging their favourable water conditions and adopting sustainable agricultural practices, the Nordic region demonstrates a proactive approach to water usage in oat production. This not only ensures a more efficient utilisation of water resources but also contributes to the overall sustainability of oat cultivation. (Mekonnen and Hoekstra, 2011)

Table 4 :

Global average water footprint of primary crops and derived crop products. Period 1996-2005 as cited in Mekonnen and Hoekstra (2011)

		Global average water footprint (m^3ton^{-1})			
FAOSTAT Crop Code	**Product Description**	**Green**	**Blue**	**Grey**	**Total**
	Wheat	1277	342	207	1827
	Wheat Flour	1292	347	210	1849
	Wheat Pasta	1124	301	183	1608
15	Dry Pasta	1292	347	210	1849
	Wheat Pellets	1423	382	231	2036
	Wheat Starch	1004	269	163	1436
	Wheat Gluten	2928	785	476	4189
	Rice, Paddy	1146	341	187	1673
	Rice, Husked (Brown)	1488	443	242	2172
27	Rice, Broken	1710	509	278	2497
	Rice Flour	1800	535	293	2628
	Rice Groats and Meal	1527	454	249	2230
	Barley	1213	79	131	1423
	Barley, Rolled Or Flaked Grains	1685	110	182	1977
44	Malt, not roasted	1662	108	180	1950
	Malt, roasted	2078	135	225	2437
	Beer Made from Malt	254	16	27	298
	Maize (Corn)	947	81	194	1222
	Maize (Corn) flour	971	83	199	1253
	Maize (Corn) groats and meal	837	72	171	1081
56	Maize (Corn) hulled, pearled, sliced or kibbled	1018	87	209	1314
	Maize (Corn) starch	1295	111	265	1671
	Maize (Corn) oil	1996	171	409	2575
71	Rye	1419	25	99	1544
	Rye flour	1774	32	124	1930
	Oats	1479	181	128	1788
75	Oats groats and meal	2098	257	182	2536
	Oats, rolled or flaked grains	1998	245	173	2416

OUR NORDIC FOCUS

Definitions: "The water footprint within a geographically delineated area (e.g. a province, nation, catchment area or river basin) is equal to the sum of the water footprints of all processes taking place in that area (Hoekstra et al., 2011). The blue water footprint refers to the volume of surface and groundwater consumed (evaporated) as a result of the production of a good; the green water footprint refers to the rainwater consumed. The grey water footprint of a product refers to the volume of freshwater that is required to assimilate the load of pollutants based on existing ambient water quality standards."(Mekonnen and Hoekstra, 2011)

REDUCED TOXICITY IN PESTICIDES:

Nordic countries have demonstrated a notable shift towards the usage of less prevalent and less toxic formulations of pesticides. This transition is attributed to a better understanding of the side effects associated with pesticides, stricter regulations and the development of new and safe biocides. Furthermore, such a shift demonstrates the commitment of Nordic regions to environmental sustainability and responsible agricultural practices. (Pettersson and Lehman, 1994)

AIR QUALITY AND CROP GROWTH:

The Nordic region benefits from exceptional air quality that surpasses the EU average. This pristine air quality creates favourable conditions for crop growth and results in increased yields compared to regions with polluted air. Pollutants like sulphur dioxide (SO2) present in polluted air can harm crops and reduce their productivity (Tingey etal., 1973). The emphasis on maintaining clean and unpolluted air in the Nordic countries highlights the importance of a healthy environment in supporting robust crop growth.

SCIENCE-BASED GOVERNANCE AND POLICIES:

Nordic countries are recognised for their science-based governance and policies, setting them apart from many other nations that may be influenced by lobbying from agrochemical companies. This approach ensures that decisions related to agriculture and farming are grounded in scientific evidence and prioritise environmental sustainability and public health. One notable aspect is the absence of genetically modified (GM) farming in the Scandinavian countries. This is primarily due to the unsuitability of the only authorised GM crop for cultivation in the EU, namely maize with Bt insect resistance, in the Nordic climate (Eriksson et al., 2018).

This focus on science-based governance and the cautious approach towards GM crops highlights the commitment of the Nordic countries to sustainable and responsible agricultural practices. (Eriksson et al., 2018)

EU'S COMMITMENT TO SUSTAINABILITY:

The European Union (EU) has emerged as a global leader in promoting agricultural sustainability and in addressing environmental concerns. In comparison to the US, Canada, and Asian countries, the EU demonstrates superior goals, policies, and a track record in sustainable agriculture. Within the EU,Sweden and Finland stand out with their even more ambitious sustainability goals and policies (Zalidis etal., 2004, as cited in Agovino et al., 2019) as well as their remarkable performance in sustainable agriculture (Agovino et al., 2019). For example, Sweden is committed to achieving net zero emissions by 2045 (Naturvårdsverket, n.d.) and Finland carbon neutrality by 2035 (State Treasury Republic of Finland,n.d.), which are much more ambitions goals compared to that of UK which aims to achieve net zero emissions by 2050 (Donkersley et al., 2021).

The distribution of ISA among EU-28 countries considering three classes i.e. high (H), medium (M) and low (L) according to the level of the ISA for the years, 2005 and 2014

Figure 2 (2005)

Figure 3 (2014)

OUR NORDIC FOCUS

EU'S COMMITMENT TO SUSTAINABILITY (CONTINUED)

The remarkable performance of Finland and Sweden can be seen further in Figures 2 and 3, which measure the Index of Sustainable Agriculture (ISA) of 28 countries that have joined the European Union over the period of 2005-2014, as developed by Agovino et al. (2019). The usage of this index illustrates that both Sweden and Finland have maintained consistantly high levels of sustainable agriculture.

Furthermore, these countries benefit from favourable natural conditions, fertile soils, and supportive infrastructure, enabling diverse and productive agricultural practices. Additionally, their competitive agricultural sectors are driven by government policies, entrepreneurial skills, state-of-the-art research and innovative supply and processing industries (Zalidis et al., 2004, as cited in Agovino et al., 2019).

The EU's commitment to sustainability is evident through its rural development policy, which allocates a significant portion of the budget to voluntary, targeted measures aimed at climate change mitigation (European Commission, 2012, as cited in Agovino et al., 2019). Each European rural development program reserves at least 30% of its budget for such measures, reflecting the EU's emphasis on sustainable agriculture. These policies prioritise investments in sustainable farming practices and supportive regulations. (European Commission, 2012, as cited in Agovino etal., 2019)

When it comes to pesticide regulations, the EU maintains stringent standards to protect human health and the environment. The European Commission oversees pesticide approval, restriction, and cancellation, ensuring that substances or products placed on the market do not pose harm.The EU prohibits the use of pesticides recognised as mutagens, carcinogens, reproductive toxicants, or endocrine disruptors, unless their exposure to humans is considered negligible. Despite criticisms, the EU remains highly competitive in agriculture and has banned numerous potentially hazardous pesticides while maintaining a significant export value of agricultural products. (Donley, 2019)

Thus, Sweden and Finland, being both guided by EU standards and regulations as well as applying their own ambitious sustainability goals, extensive infrastructure, and commitment to stringent regulations, emerge as optimal choices for sourcing sustainable oats. Furthermore, their dedication to sustainable agriculture and environmentally conscious practices ensure the availability of oats that meet high sustainability standards.

SUMMARY: BENEFITS OF GROWING OATS IN THE NORDIC REGION

Cultivating oats in the Nordic region offers significant advantages, particularly in the context of sustainability and resilience to future climate change. The European Union (EU) has established robust goals and policies to promote sustainable agriculture, and the Nordic countries, such as Sweden and Finland, have shown even greater ambition in this regard.

Oats are well-suited to the Nordic climate and exhibit resilience in the face of changing weather patterns. The region's cooler temperatures and abundant rainfall provide favourable conditions for oat cultivation. As climate change brings uncertainties and challenges to agricultural systems worldwide, the Nordic region's suitability for oat production becomes increasingly valuable.

Moreover, the Nordic countries' proactive approach to sustainable agriculture, extensive infrastructure, and stringent regulations contribute to their resilience in adapting to future climate change impacts. By investing in sustainable agricultural research and plant breeding, providing comprehensive advisory services, and prioritising science-based policy-making and collaboration, these countries are equipping their farmers with the tools and knowledge to mitigate and adapt to changing climatic conditions effectively.

In summary, growing oats in the Nordic region offers dual benefits of sustainability and resilience to future climate change. The EU's commitment to sustainable agriculture, coupled with the Nordic countries' favourable natural conditions and proactive policies, make them an ideal choice for sourcing oats. By selecting oats from the Nordic region, consumers support not only sustainable farming practices but also contribute to building resilience in the face of an uncertain climate future.

SUSTAINABLE PRACTICES

Sustainability practices employed by the specific countries of our suppliers.

FINLAND

OATS IN THE FINNISH AGRICULTURAL LANDSCAPE

Oats (*Avena sativa L.*) hold a significant position in Finnish agriculture, alongside barley (*Hordeum vulgare L.*), as the most commonly grown cereals (Hakala et al., 2020). With the increasing global temperatures, Finland has experienced a similar rise in average temperatures, and projections indicate even greater temperature increases in the future, particularly in higher latitudes (Parikka et al., 2012). By 2055, average annual temperatures in Finland could surge by 1.8°C to 5.2°C (Jylhä et al. 2004 as cited in Parikka et al., 2012) . Although changes in precipitation patterns are anticipated, the growing season is expected to witness more moderate shifts (Ibid.)

SPECIALISED OAT CULTIVATION IN SASTAMALA

Taking advantage of the favourable Finnish climate, specialised oat cultivation practices have emerged, particularly in Sastamala. Here, a farmers' ring has been established, focusing on growing oats with high beta-glucan values. Beta-glucan is a key component associated with the nutritional benefits of oats, making it a sought-after quality in the market. This specialised approach not only promotes sustainable agricultural practices but also presents an economically viable opportunity for farmers in the region. (LUKE - Natural Resources Institute Finland, n.d.)

GOVERNMENT RESEARCH - LUKE

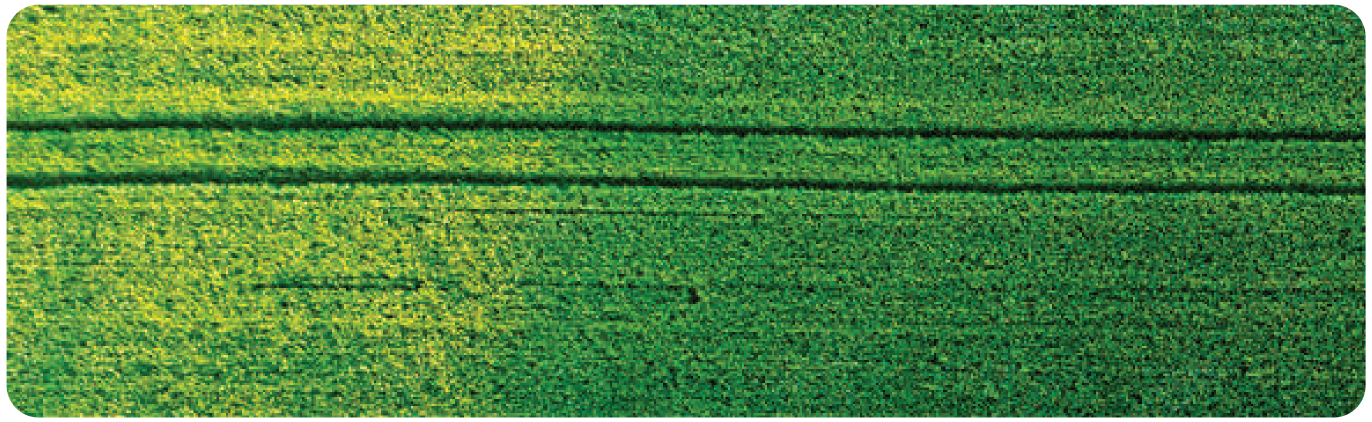
In addition to the farmers' ring, Finland benefits from the expertise provided by LUKE, a renowned government research institute. LUKE offers valuable guidance and support to farmers in Finland, sharing knowledge on optimising crop production, sustainable land management, and biodiversity preservation. This collaboration between farmers and research institutions like LUKE further enhances the sustainability and productivity of Finnish oat cultivation. (LUKE Natural Resources Institute Finland, n.d.)

GROWING ORGANIC FARMING IN FINLAND

Finland has witnessed a steady growth in organic farming, with the aim of reaching 20% organic cultivation by 2020 (MMM, 2014 as cited in Väre et al., 2021). By 2019, organic production covered around 13% of the total cultivated area, with oats being one of the major organic crops (Finnish Food Authority, 2020 as cited in Väre et al.,2021). This highlights the sustainable practices embraced in oat production, further emphasising Finland's commitment to environmentally friendly agriculture.

SUMMARY

In summary, Finland's favourable climate, specialised oat cultivation practices, and prominent position as a leading oat producer make it an ideal choice for obtaining sustainably grown oats. Furthermore, the country's dedication to producing high beta-glucan oats, alongside its increasing focus on organic farming, showcases its commitment to sustainability and resilience in the face of future climate changes.



SUSTAINABLE PRACTICES

SWEDEN

GOVERNMENT POLICY FOR LANDSCAPE PRESERVATION AND ENERGY

In Sweden, the government has implemented policies to protect the agricultural landscape while also preserving biodiversity. These policies aim to promote sustainable farming practices and contribute to the preservation of ecosystems. Examples of national environmental objectives include initiatives to reduce pesticide and fertiliser use. Furthermore, Sweden is also an example of a nation without a reliance on fossil fuels, with around 93% of Swedish electricity being generated by hydroelectric and nuclear power (Foster et al., 2006). These initiatives and shift towards sustainable energy use, demonstrate Sweden's commitment to furthering sustainable practices.

LANTMANNEN FARMING COOPERATIVE

Lantmannen is a highly influential farming cooperative which is comprised of approximately 20,000 Swedish farmers. This cooperative not only provides employment opportunities for the local area but also allows farmers to have real influence on farming enterprise and innovation through membership and council meetings. Thus, this cooperative plays a crucial role in supporting farmers and driving innovation in the agricultural industry (Lantmännen, n.d.).

SWEDEN'S COMMITMENT TO NET-ZERO EMISSIONS

The Swedish government is committed to improving the potential of farmland and supporting agricultural innovations in order to increase food production without negatively impacting the environment. Currently, the government has set a target of achieving zero net emissions by 2045, in accordance with the Paris Agreement. (Naturvårdsverket, n.d.)

OAT PROCESSING

A quick summary of the various oat processing techniques we utilise, highlighting their positive impact on sustainability. For detailed oat process flow charts, please refer to the ingredient sustainability profiles.

MILLING PROCESS: CLEANING, CONDITIONING, THERMAL TREATMENT

The milling process for oats involves several key steps. First, the oat crop needs to be cleaned and conditioned, which requires substantial water and energy usage to eliminate undesired materials and prepare the grains for further processing. Additionally, a thermal treatment is applied to the oats before milling, deactivating enzymes and facilitating the removal of husks (Galanakis, 2018). These steps contribute to the overall sustainability of oat milling by ensuring product quality and uniformity.

ENERGY AND WATER USAGE: IMPACT AND SUSTAINABILITY

The milling of cereal crops, including oats, demands significant energy and water resources. For instance, the milling of wheat consumes an estimated 4-7 kWh per 50kg of flour (Gwirtz, 2008). The sustainability of milling processes relies on the energy source employed. If fossil fuels are solely relied upon, the associated environmental impact would be substantial. However, by transitioning to renewable energy sources like solar power, the environmental footprint of oat milling can be significantly reduced.

UTILISATION OF BY-PRODUCTS: OAT BRAN AND SUSTAINABLE APPLICATIONS

The milling process generates valuable by-products, such as oat bran, which offers various sustainable applications (Ralla et al., 2018). Oat bran contains essential nutrients, including beta-glucan, protein, fat, and minerals, making it suitable for human nutrition (Butt et al., 2008). It also exhibits properties suitable for cosmetics, including soothing, moisturising, and anti-irritating effects. The utilisation of oat bran in skincare products aligns with sustainability goals by reducing waste and maximising the value of milling by-products.

ENHANCING SUSTAINABILITY: INNOVATIONS AND FUTURE DIRECTIONS

To advance the sustainability of milling processes, innovative measures are crucial. This includes optimising energy and water usage, exploring renewable energy sources, and developing efficient methods for utilising milling by-products. By adopting these measures, the oat milling industry can minimise its environmental impact, reduce food waste, and contribute to a more sustainable agricultural sector.

OAT PROCESSING

ENZYMATIC MILLING

SUSTAINABLE ALTERNATIVE TO WET MILLING

Enzymatic milling (E-milling) is a sustainable variant of wet milling that utilises proteases to enhance the milling process. By adding proteases, E-milling reduces processing time, energy costs, and eliminates the need for additional agents such as sulphur dioxide (SO2), an air pollutant associated with respiratory illnesses and acid rain formation (Johnston and Singh, 2004; Ramírez et al., 2009). The reduction in SO2 usage achieved through E-milling can have significant environmental benefits.

COMPLEX PROCESS AND EFFICIENCY GAINS

E-milling involves several stages, including cleaning, pre-treatment, enzymatic treatment, germ separation, fibre separation, gluten separation, and starch separation. This process offers notable advantages, such as reducing steep time from 36 hours to 6 hours, mitigating enzyme costs through energy savings, and increasing yield percentage (Ramírez et al., 2009). Moreover, optimising grain preparation, grind quality, and pH conditions can further minimise enzyme input requirements,enhancing process efficiency (Johnston and Singh, 2004).

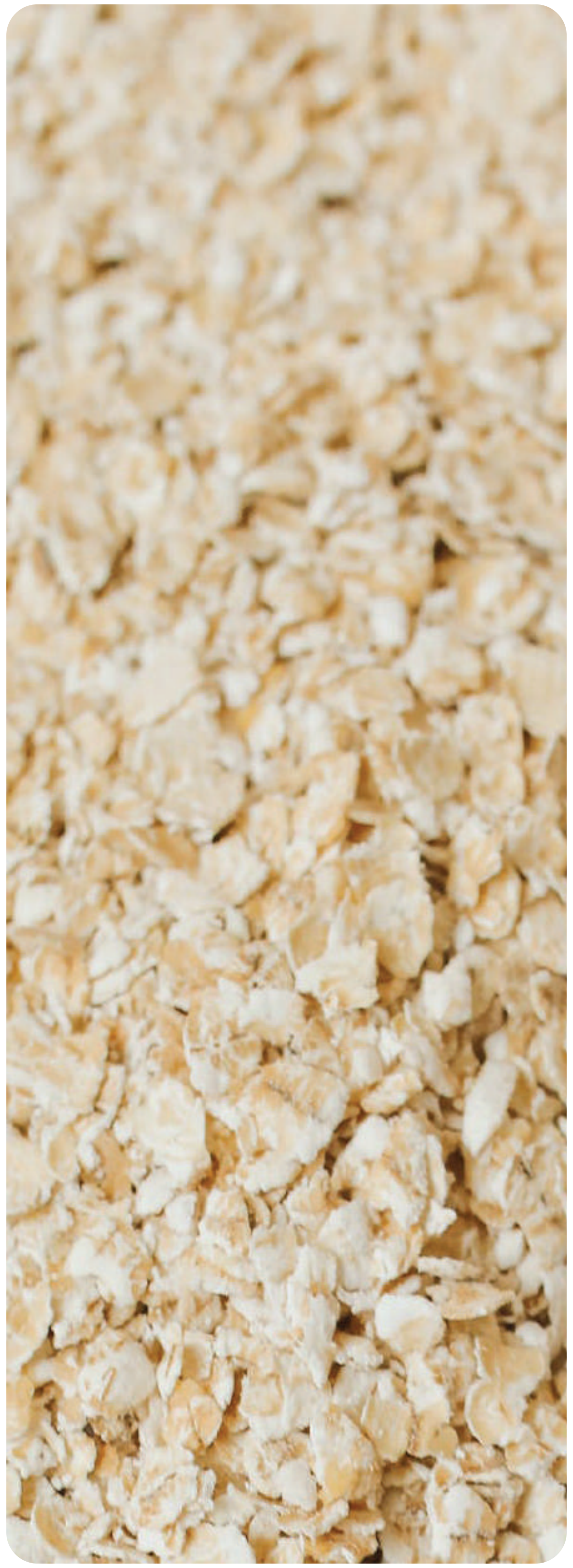
ENVIRONMENTAL AND ECONOMIC CONSIDERATIONS

The incorporation of enzymes into traditional milling techniques has gained popularity due to its environmental and economic benefits. Microbial enzymes effectively remove cell wall polysaccharides while preserving nutritional content and beneficial compounds (Singh et al., 2015). Additionally, biological pre-treatments, such as enzymatic treatment of wheat straw, have shown a significant reduction in energy use (32-35%) and particle size (15-22%), resulting in enhanced milling efficiency and substantial energy savings (Motte et al., 2015). Although E-milling may incur slightly higher operating costs, it can reduce capital costs by approximately 5.5% compared to traditional wet milling processes (Ramírez et al., 2009).

By embracing enzymatic milling techniques, the milling industry can reduce its environmental impact, minimise the use of harmful chemicals, and improve overall sustainability in cereal processing.

OAT PROCESSING

EXTRUSION



SHAPING SUSTAINABLE CEREAL PRODUCTS

Extrusion plays a crucial role in shaping cereal products through the application of pressure, heat, and mechanical force. Two common forms of extrusion in food processing are cold extrusion, which compacts the product, and thermoplastic extrusion, widely used in the cereal manufacturing industry, which involves high temperatures and pressures resulting in product expansion and chemical changes (Menis-Henrique et al., 2020; Riaz, 2010).

ENERGY AND STEAM USAGE OPTIMISATION

Extrusion processes incur high energy costs primarily due to the consumption of energy and steam. Steam production costs are significantly lower than electricity costs, making it crucial to maximise steam usage for sustainability. The implementation of heat recuperation technology can further enhance sustainability by pre-heating raw materials and promoting circularity within the system (Kaválek,2019).

COMPLEX PROCESS AND RESOURCE CONSIDERATIONS

Extrusion processes require specialised equipment, skilled operators, and involve substantial water and energy consumption rates (Moscicki, 2011). Twin screw extruders are commonly used in the food industry, but screw configurations can be customised for specific processes (Maskan and Altan, 2012). Various physical factors, such as water feed, screw speed, and temperature, influence resource usage and product quality outcomes. Adjusting these factors can optimise energy efficiency, expansion rate, and density (Pathania et al., 2013).

EVALUATION FOR SUSTAINABILITY

Determining the energy consumption and efficiency of extrusion processes is challenging due to the complex relationships between food, water, and extruder conditions. While extrusion processes inherently involve some loss of heat and power input, cereal processing has shown to be relatively efficient in extrusion (Fayose and Huan, 2015). Nevertheless, evaluating each process individually, considering product outcome requirements and resource availability, is essential for determining the optimal sustainability of extrusion techniques.

OAT PROCESSING

SOLVENT EXTRACTION

SUSTAINABLE SOLVENT EXTRACTION: CHOOSING WISELY

Solvent extraction is a process that relies on selective solvents to isolate desired substances. To ensure sustainability and success, considerations such as solvent choice, water content, and boiling point are crucial. Dry materials are preferred for efficient solvent saturation, while selecting a low-boiling-point solvent minimises energy consumption and potentially preserves other beneficial compounds in the crop (Erasmus and Taylor, 2003; Hoffmann, 1989).

MANAGING VOLATILE ORGANIC COMPOUNDS (VOCS)

Commonly used solvents in extraction, such as volatile organic compounds (VOCs),including hydrocarbons, esters, ethers, and alcohols, pose health and environmental risks. Stricter legislation and concerns over crude oil dependency and storage/disposal costs highlight the need for sustainable solvent alternatives (Li, Smith, and Stevens, 2016). To mitigate their negative impact, contaminated solvents can be recovered through methods like membrane separation, multi-stage absorbtion, or distillation, extending their lifespan and reducing the need for new solvents (Condorchem, n.d.).

EXPLORING GREEN SOLVENTS

Solvents derived from renewable biological sources, such as plants and algae, offer a sustainable alternative. These green solvents are typically non-hazardous, biodegradable, and can be obtained from various sources, including crop waste and urban waste. Utilising waste that would otherwise end up in landfills enhances the sustainability of solvent extraction (Li, Smith, and Stevens, 2016). Extracting carotenoids from tomatoes using green solvents derived from orange peels demonstrates the effectiveness of this approach (Chemat-Djenni et al., 2010).

CONSIDERING SOLVENT SELECTION

To facilitate sustainable practices, solvent selection guides have been developed, providing insights into solvents' waste, health impacts, environmental disposal,reactivity, flammability, and production effects. These guides, such as the one by Glaxo Smith Kline (Glaxo Smith Kline, 2009), assist in making informed choices and increasing the sustainability of scientific and engineering processes (Henderson et al.,2011).

FERMENTATION

SUSTAINABLE FERMENTATION: ENHANCING GRAIN TRANSFORMATION

Fermentation is an ancient process used in the production of bread and beer, relying on lactic acid bacteria and yeasts. During fermentation, microbes metabolically interact with the grains, producing lactic and acetic acids, carbon dioxide, ethanol,and potentially forming new compounds like prebiotic oligosaccharides (Poutanen etal., 2009). The benefits of fermentation include improved nutrient availability, protein and polysaccharide hydrolysis, and the exploitation of cereal by-products (Verni et al.,2019).

ENHANCED NUTRIENT AVAILABILITY

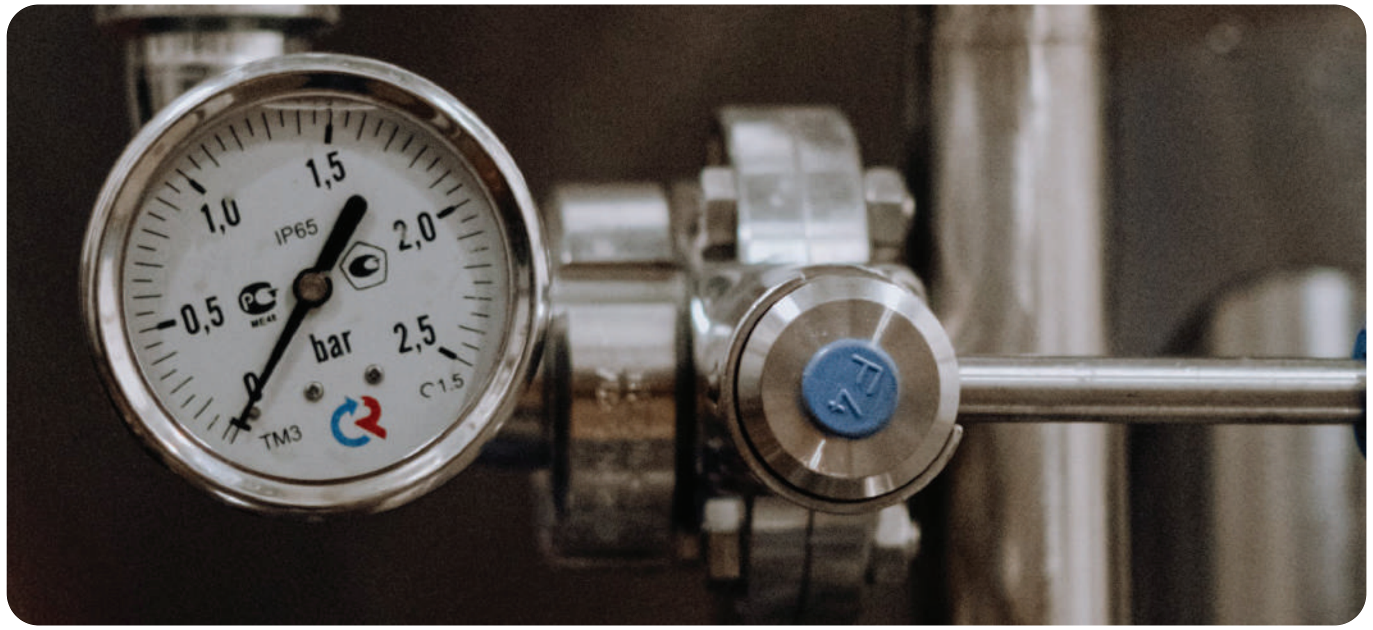
Fermentation can modulate the pH to favour certain enzymes, altering the bioavailability of compounds and improving nutrient availability. This process can enhance the solubilisation of proteins and polysaccharides while generating beneficial compounds like prebiotic oligosaccharides, which stimulate the growth of specific bacteria (Poutanen et al., 2009; Rycroft et al., 2001). Additionally, fermentation shows promise in reducing cooking energy requirements (Petrova and Petrov, 2020),further highlighting its sustainability potential.

SUSTAINABLE FERMENTATION STRATEGIES

Efforts to make fermentation processes more sustainable have been explored by companies like Cargill. Increasing the concentration of fermentation materials directly impacts energy requirements. For example, a 20% increase in ethanol concentration during yeast fermentation led to a 10% reduction in steam requirements, while a 20% increase in lactic acid titer resulted in a 20% reduction in water consumption. Optimising fermentation concentration for 2-keto-L-gulonic acid achieved a 150% titer increase, reducing steam requirements by 75% (Pothakos et al.,2018).

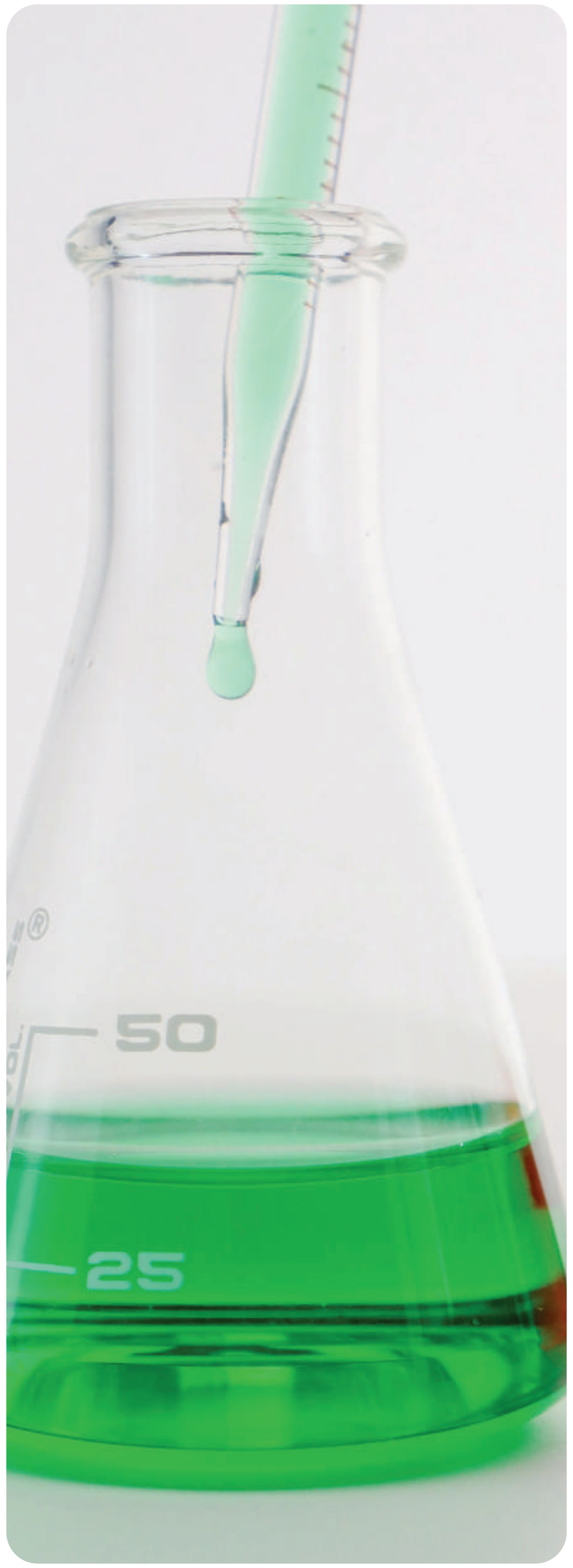
MICROORGANISM DIVERSITY FOR OAT FERMENTATION

Oats can be fermented using various microorganisms, each offering specific benefits. Fermentation with *Lactobacillus* plantarum increases lysine and alanine in oat beverages, *Pleurotus ostreatus* fermentation enhances soluble nitrogen and reduces tannin content, filamentous fungi fermentation reduces phytic acid content, thereby improving nutrient availability and protein solubility, and *Rhizopus oligosporus* fermentation preserves oat mineral content (Kårlund et al., 2020). The increased nutritional availability resulting from fermented grains may reduce raw material input requirements and enhance overall sustainability when integrated into extraction processes.



GREEN CHEMISTRY

PRINCIPLES OF SUSTAINABLE CHEMISTRY



GUIDING ECO-FRIENDLY PRACTICES

Green Chemistry is based on the influential work of Paul Anastas and John Warner, who proposed the '12 Principles of Green Chemistry' in 1998 (Anastas and Warner, 1998). These principles provide a comprehensive framework for minimising the use of toxic solvents, reducing waste generation, and promoting environmentally friendly practices in chemical processes and analyses (Anastas, 1999 as cited in de Marco et al., 2019). They were established to address the environmental and occupational hazards associated with industrial activities (Lenardão et al., 2003; Prado, 2003 as cited in de Marco et al., 2019).

By adhering to the 12 Principles of Green Chemistry, we integrate sustainability into our chemical processes and strive to minimise our environmental footprint. Our commitment to green chemistry ensures that we design and produce chemical products and processes that are safer for humans, animals, plants, and the environment. The 12 Principles of Green Chemistry guide our approach to sustainable practices, ensuring that our chemical products and processes align with the principles of environmental responsibility.

For information on the practices of a specific ingredient, please refer to the specific ingredient sustainability profiles. These principles are as follows:

GREEN CHEMISTRY PRINCIPLES

PREVENTION

01 Preventing waste is better than treating or cleaning up waste after it is created.

ATOM ECONOMY

02 Synthetic methods should maximise the incorporation of all materials used in the process into the final product, minimising waste generation.

LESS HAZARDOUS CHEMICAL SYNTHESES

03 Synthetic methods should avoid using or generating substances toxic to humans and the environment.

DESIGNING SAFEER CHEMICALS

04 Chemical products should be designed to achieve their desired function while being as non-toxic as possible.

SAFER SOLVENTS AND AUXILIARIES

05 Auxiliary substances should be avoided wherever possible, and when necessary, they should be non-hazardous

DESIGN FOR ENERGY EFFICIENCY:

06 Energy requirements should be minimised, and processes should be conducted at ambient temperature and pressure whenever possible.

Continued

USE OF RENEWABLE FEEDSTOCK

07 Whenever practical, renewable feedstocks or raw materials should be used instead of non-renewable ones.

REDUCE DERIVATIVES

08 The unnecessary generation of derivatives and additional reagents should be minimised or avoided.

CATALYSIS

09 The use of catalytic reagents that can be used in small quantities to repeat a reaction is preferred over stoichiometric reagents.

DESIGN FOR DEGRADATION

10 Chemical products should be designed to break down into non-harmful products after completing their function.

REAL-TIME ANALYSIS FOR POLLUTION PREVENTION

11 Analytical methodologies should be developed to enable real time monitoring and control before hazardous substances are formed.

INHERENTLY SAFER CHEMISTRY FOR ACCIDENT PREVENTION:

12 The substances and their forms in a process should be chosen to minimise hazards.

Verified Biodegradability: A concise overview of our products' environmental impact and their commitment to a greener future

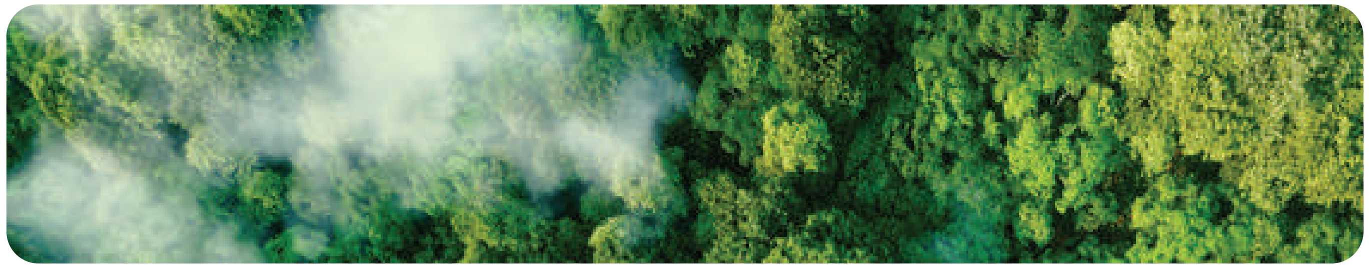
BIODEGRADABILITY

Our dedicated research and development team, in collaboration with Chemex Environmental International Limited based in Cambridge, United Kingdom, has conducted comprehensive assessments to evaluate the environmental impact of our formulations. The majority of our products underwent biodegradability testing using the OECD 301F manometric respirometry test, a widely recognised method for measuring ready biodegradability. Furthermore, these tests were conducted in accordance with the OECD Principles of Good Laboratory Practice and the Chemex standard procedure. The accuracy and completeness of all results are also ensured by a dedicated Quality Assurance unit.

For some of our products, notably Rejuvaveen, alternative testing methods were employed. Specifically, the method used was a Closed Bottle Procedure. This method aimed to measure the rate and extent of biodegradation when exposed to freshwater microorganisms for 28 days, following the method detailed in Cheshire Eco Solutions SOP III. 18 and in accordance with OECD guideline 301D.

The ready biodegradability of the samples for both methods were measured by determining the ratio of Biochemical Oxygen Demand (BOD) within 28 days to either the Theoretical Oxygen Demand (ThOD) or the Chemical Oxygen Demand (COD), as defined by the study objectives. Our testing procedures primarily involved the preparation of a mineral medium by combining mineral nutrient stock solutions with deionised water. These tests were conducted in a freshwater environment utilising activated sludge obtained from a sewage treatment works that primarily receives domestic waste.

Thus, by prioritising and verifying the biodegradability of our products in accordance with these rigorous standards and procedures, we aim to minimise their environmental footprint. We believe that as a sustainable business we should not only deliver exceptional results but also contribute positively to our planet. With our verified biodegradability values, customers can trust that our products are designed with environmental responsibility in mind. For further details on the biodegradability of specific products, we encourage you to refer to the respective product sustainability profiles.



TRANSPORT

Transportation Partners: Promoting Sustainable Logistics. For detailed oat process flow charts, please refer to the specific ingredient sustainability profiles.

At Oat Cosmetics, we recognise the importance of sustainable transportation in minimising our environmental impact. While we rely on external freight providers for our transportation needs, we strive to collaborate with forwarders who share our commitment to sustainability. Our main transportation partners, TNT, DB Schenker and Kuehne + Nagel are all ISO9001:2015 accredited and each demonstrate their dedication to responsible practices, contributing to our sustainability goals.

TNT EXPRESS

TNT actively promotes a safety culture and adheres to health and safety standards. They prioritise improving CO2 efficiency and air quality while encouraging awareness and training in environmental management. (TNT, n.d.)

DB SCHENKER

DB Schenker is aligned with the UN Sustainable Development Goals and focuses on clean logistics. They aim to achieve climate neutrality by 2040 and provide emission reduction solutions throughout their supply chain. (DB Schenker, n.d.)

KUEHNE & NAGEL

Kuehne & Nagel recognises the logistics industry's responsibility to safeguard the environment. They are committed to a zero carbon business model and actively participate in sustainability initiatives such as the UN Global Compact. (Kuehne+Nagel, n.d.)

OUR CARBON FOOTPRINT

While we currently do not have detailed information on the carbon footprint of our shipments, we have recognised the importance of assessing and improving our environmental impact. It is on our radar to evaluate the carbon footprints of our logistics, seeking ways to enhance sustainability throughout our supply chain. In this pursuit, we are pleased to note that DB Schenker, one of our key partners, offers a carbon footprint tool on their portal. This tool provides valuable information that can help us measure and analyse the carbon emissions associated with our transportation activities. Although we have yet to utilise this tool, we appreciate the potential it holds for future sustainability initiatives, enabling us to make informed decisions and drive positive change in our transportation practices.

FUTURE OBJECTIVES

At Oat Cosmetics, we are committed to continuously exploring opportunities for improvement and finding innovative solutions to minimise the environmental impact of our transportation practices. By leveraging the expertise and tools available, together with our forwarders, we aim to drive positive change and contribute to a greener future. Furthermore, through collaboration and a shared commitment to sustainability, we can collectively work towards reducing our carbon footprint and building a more environmentally responsible transportation system.

PACKAGING

Balancing Sustainability and Quality Retention

At Oat Cosmetics, we recognise the critical role that packaging plays in both preserving the quality of our products and minimising our environmental impact. Finding the right balance between sustainability and quality retention is a complex endeavour that requires careful consideration and continuous improvement.

Our commitment to sustainability drives us to explore innovative packaging solutions that reduce waste, promote recycling, and minimise the use of non-renewable resources. We actively seek packaging materials with a lower environmental footprint, such as recyclable options, and work towards optimising packaging designs to minimise material usage and maximise efficiency.

However, it is essential to acknowledge that certain packaging standards and regulations are necessary to ensure the effectiveness, safety, and composition of our products. Thus, we strive to meet these requirements while still prioritising sustainable practices. This delicate balance between sustainability and quality retention presents an ongoing challenge that we address through rigorous research, testing, and collaboration.

For more detailed information on our specific packaging strategies and initiatives, we encourage you to refer to the individual ingredient profiles for each of our products. These reports provide comprehensive insights into the specific packaging choices made for each product and their environmental impact.

SUMMARY AND FUTURE OBJECTIVES

Just like any project, we realise becoming fully sustainable is a process, which is why we have set ourselves a series of goals which we will aim to achieve within the upcoming years...

Achieve ECOVADIS silver by the year

2024

Complete full packaging review by

2024

Include distributor sustainability section in the brand audit by

2024

MESSAGE FROM OUR LEADERS

Discovering the CEO's unwavering dedication to sustainability, quality, and traceability to fuel our company vision for a greener future:

In conclusion, sustainability, quality and traceability are the guiding principles that define our company's values and practices. This corporate sustainability and responsibility report highlights our unwavering commitment to these principles, encompassing the integral aspects of People, Profit, and Planet, which collectively shape our holistic understanding of sustainability. Looking ahead, we remain dedicated to continuous improvement in sustainability, alongside our other core values. We will challenge boundaries, explore innovative solutions,and foster partnerships with like-minded individuals and organisations who share our vision. While acknowledging that there is still much progress to be made, we firmly believe that through collective efforts, we can pave the way for a more sustainable future for generations to come. Our heartfelt appreciation goes out to all our stakeholders, employees, and customers who have joined us on this remarkable sustainability journey.

"At the heart of our business, sustainability is not just a goal, but a guiding principle. Greenwashing has no place in our organisation and we are dedicated to being transparent about our sustainability initiatives, acknowledging both our successes and areas for improvement. Together with our incredible team, we strive to embed sustainability into every aspect of our operations and by holding ourselves accountable, we ensure that our commitments are meaningful and impactful."

James Daybell, CEO, Oat Cosmetics

Oat Cosmetics emerges as a shining example of corporate social responsibility, exemplifying a commitment to sustainable practices and ethical conduct throughout its operations. From responsible sourcing of raw materials to the development of eco-friendly production processes, Oat Cosmetics has demonstrated a dedication to minimising its environmental impact. The company's initiatives extend beyond compliance, actively contributing to the communities it operates in and prioritising the well-being of its stakeholders. Our company's CSR efforts are not just a corporate obligation; they are integral to the company's identity and values. By intertwining business success with social and environmental responsibility, Oat Cosmetics paves the way for a more conscientious and sustainable future in the cosmetics industry. This report showcases Oat Cosmetics' commitment to making a positive impact, proving that ethical business practices and profitability can go hand in hand.

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