



**Circular  
Excellence**

# Today, Citribel is the only genuinely circular producer of citric acid, citrates, and other high value co-products through natural surface fermentation (of sugar molasses) worldwide.

## **Citribel is a producer of citric acid, citrates, and other natural co-products and components.**

It all started in 1919 in Tienen with the first manufacturing of citric acid by fermentation of sugar. Citric acid is an organic, odourless, and colourless crystalline substance, which occurs naturally in plants and fruits. Over the years, the production process gradually improved, and became more circular. As early as 1947, efforts were made to increase efficiency and circularity: a side stream of the nearby sugar industry - sugar molasses - was tested as an alternative raw material. Results were promising and sugar molasses quickly became the main raw material

to produce citric acid. In addition, the high volumes of interesting co-products gradually became a more and more important source of innovation potential.

Today, Citribel is the only genuinely circular producer of citric acid, citrates, and other high-value co-products through natural surface fermentation (of sugar molasses) worldwide. Its products are widely used in the food, pharmaceutical, feed, and agricultural sectors, as well as in many new niche applications.

# Our values



## We're built to last

From 1919 till today, we honour the hard work, knowledge and trust former generations have poured into the company. They provide us with the craftsmanship and the experience to continuously create high-quality products. **Upon the solid foundation of the past, we build for the future.**




## We're born to be bold

We find ourselves at the hallmark of a global transition towards sustainability and circularity. Our products and our processes derive from nature, and it is our duty and privilege to give back to the environment. We balance thoughtful decision-making and bold curiosity. We embrace the wisdom of uncertainty, as **it invites us to get creative, to make things work differently, and to continuously contribute to the health and well-being of our people and planet.**



## We're in it together

**The Citribel production processes are a daily reminder of connectedness.** Once you've seen it with your own eyes, it's impossible to forget that everything is linked: the molasses and the fungi, the mycelium and the citric acid, the water and the fish, the fermentation and the crystallisation, our colleagues and their families, the buildings and the neighbourhood, the company and its environment, the past and the present, the present and future generations.



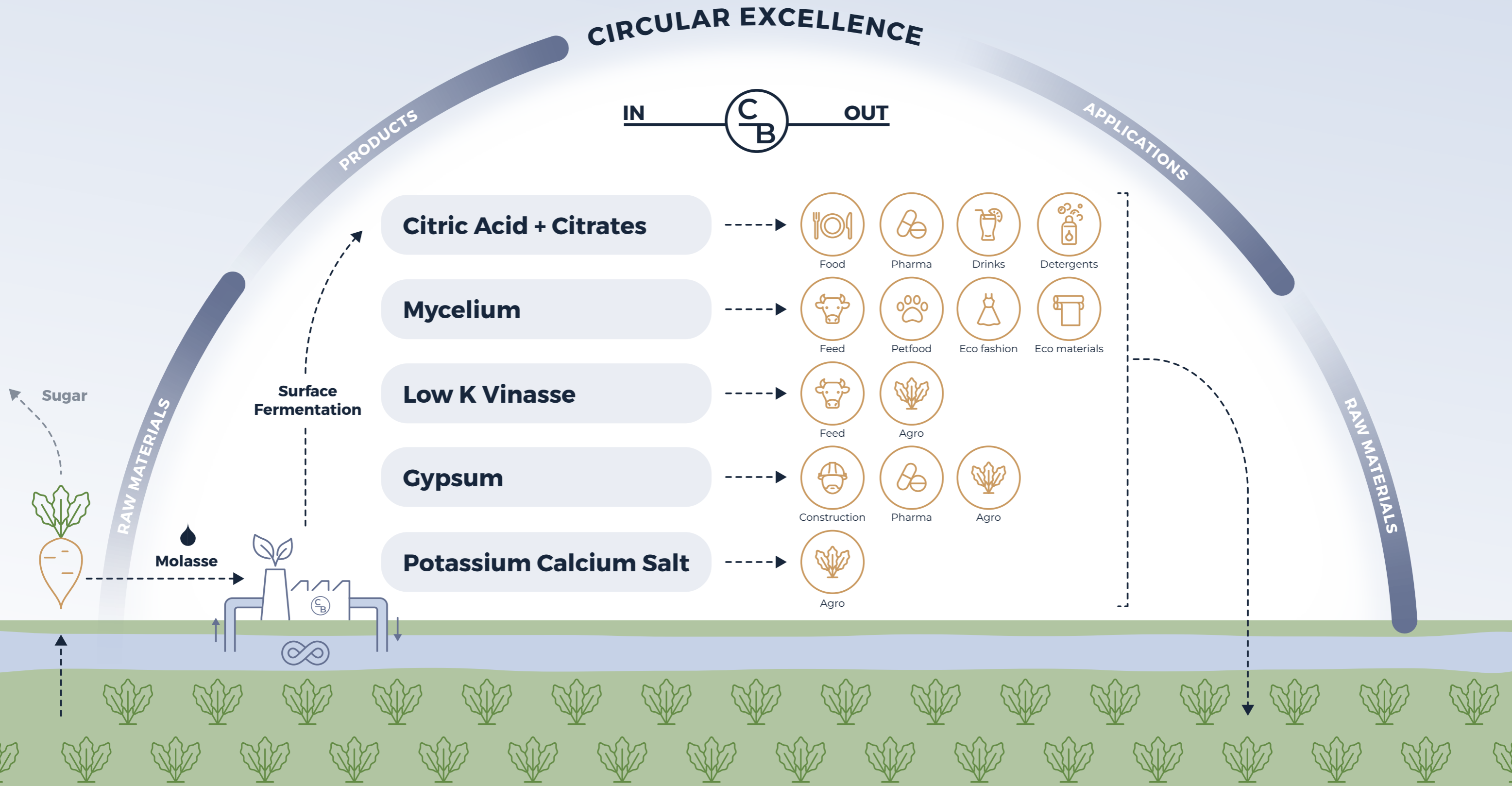
**“It’s hard not to be passionate about Citribel. The rich history is only one aspect, it’s the people that show up every day, and the circularity that Citribel carries in its core. We unceasingly look for further recycling and upcycling opportunities.”**

— Maayke, COO

# Closing the circle

Circularity is at the heart of Citribel. We are the only citric acid company in the world that uses sugar molasses as its major raw material, a co-product of sugar refineries. Our distinct manufacturing processes result in

a high-end assortment of intrinsically circular products, allowing us to **transform our raw materials into new raw materials for our customers, hence closing the circle.**



**“Everyone at Citribel contributes every day to our circular story. It’s something to be proud of.”**

— Sanne, Sustainability Manager



# Our production processes

Our circular approach pervades all our operations. Firstly, by valorising almost all our waste streams, there is very little residual waste left. In addition, we fully implement our circular vision in our water and energy management, with the goal of further reducing our carbon footprint and minimising our water usage and impact. Citribel is ISO 14001-certified for its environmental management system, and **we strive to consistently enhance every area of our company's environmental performance.**



① Fermentation



② Refinery

# Our production processes

## ① Fermentation

The Citribel production processes take place in a sophisticated ecosystem of interrelated stages and streams. Sugar molasses are the ideal nourishment for our 'Citribel fungus'. It produces long fibres (known as mycelium) during the fermentation process, which converts the sugar in the molasses to liquid citric acid. We monitor and adjust an extensive variety of factors in 184 fermentation chambers (such as temperature, humidity, surface tension, etc.). The mycelium is ready after a few days, when most of the sugar has been converted. The mycelium and the liquid mixture, which contains citric acid, are then carefully separated.

## ② Refinery

Next, the crude citric acid solution undergoes a reaction with lime milk. The filtrate is then pumped to the co-products facility, after the citric acid is precipitated as calcium salt. The salt is dissolved again with sulphuric acid, resulting in a decomposed citric acid solution and a co-product, gypsum.

The gypsum is separated by filtration. The decomposed citric acid solution is further purified using ion exchange, activated charcoal, and crystallisation processes. The citric acid crystals are then pure and can be dried, sieved, and packaged.

We also manufacture trisodium citrate dihydrate (TSC) and monosodium citrate anhydrous (MSC), both of which are generated by neutralising citric acid with caustic soda. The odourless, white granular crystals both have a pleasant, salty, and somewhat tart flavour. TSC and MSC are commonly used in a wide range of technical applications, including coagulant and emulsifying agents, buffering and sequestering agents, and foods and beverages.



# Our high-value co-products

We manufacture several high-end circular co-products, such as mycelium, potassium calcium salt, gypsum, and vinasse during the fermentation, separation, purification, crystallisation, and drying processes. Our mission is to help businesses and brands understand the many potential and prospective applications of these products.

A significant amount of potassium calcium salt is generated by the specific production process we use. The **potassium calcium salt**, which is valued as a fertiliser by many farmers, is sold under the **Citrofert®** brand name.

Our **gypsum** powder, supplied under its brand name **Citrogips®**, is used in dental and medicinal applications, as well as construction materials and agriculture.

The residual organic part of molasses is concentrated and delivered as an intriguing vinasse with a low potassium level at the end of our downstream process. **Nutribond®**, our brand of **low K vinasse**, is primarily sold to the feed industry. It is also the subject of many innovative applications and natural product concepts.

Finally, **mycelium** is a protein-rich structure with a wide range of natural components and unique functional characteristics. Under the brand name **Citrocell®**, most of our volume — six soccer fields per day — is sold to the feed business.

Moreover, we have perfected the harvesting, drying, and milling of our wet mycelium, resulting in a unique,

easy-to-use powder suitable for a wide range of uses. New products and applications are constantly being created in collaboration with various innovation partners, each time in response to unique and developing market demands.



**“Continuous upcycling of side streams to achieve circular excellence is the core business of the innovation team, and Citribel’s true strength. We’ve taken our deep technical expertise to the next level by introducing fresh ideas and opening up new opportunities.”**

— Ruben, Innovation Manager

# Energy

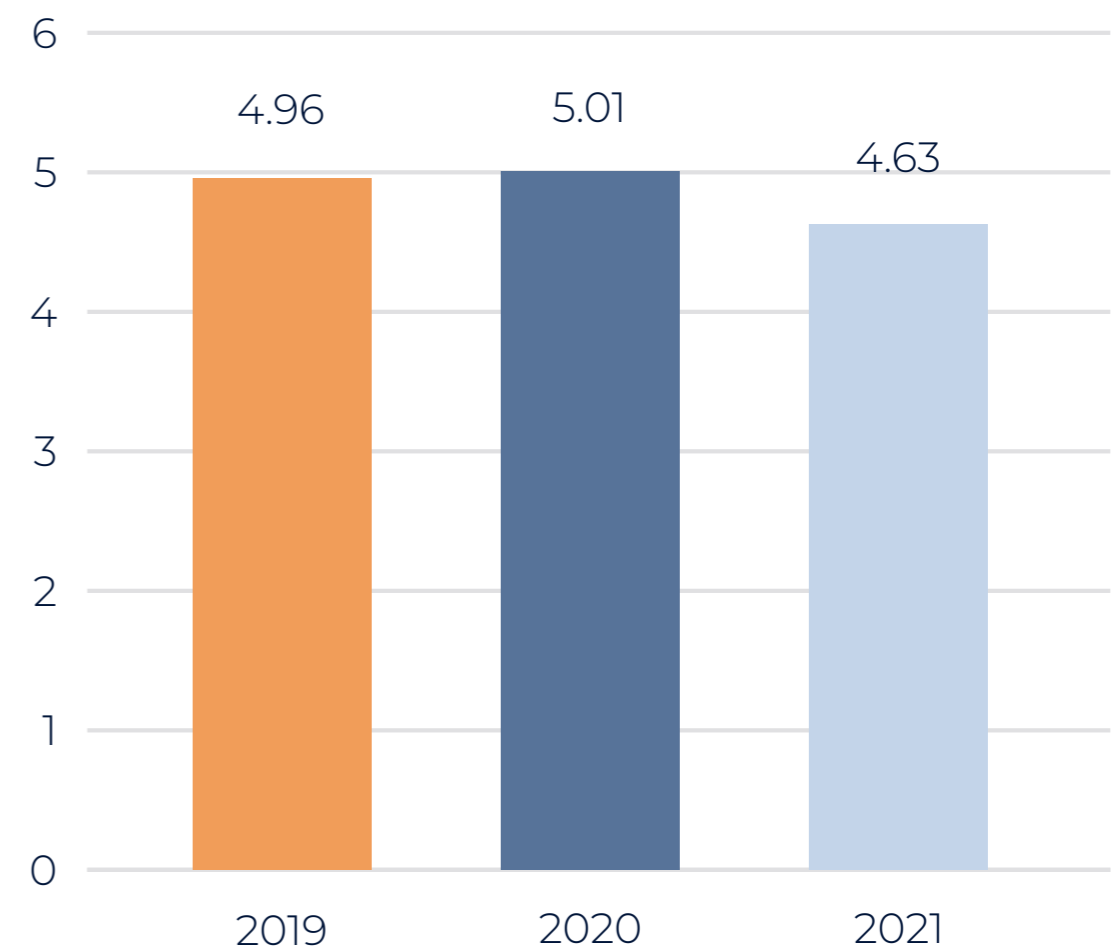
**By reducing our energy use and carbon emissions, we strive to contribute to a cleaner, better, and more sustainable world.**

Citribel is the only producer in the world that uses surface fermentation to produce citric acid. This process, which we have gradually perfected for more than a century, uses far less energy than the commonly employed deep tank fermentation.

We continuously invest in projects aimed at reducing energy consumption and carbon emissions. These investments include the construction of a new

energy plant, the construction of hot water circuits to recycle excess heat, the implementation of smart energy systems, and the relighting and insulating of facilities and equipment. Simultaneously, Citribel has become self-sufficient in electricity generation, injecting large volumes of power into the grid, and supports net balancing to ensure a stable electrical supply to the region.

We are currently working on a detailed carbon road map and action plan, as reducing carbon emissions will continue to be critical to our success.



*Energy intensity GJ per ton of produced goods (2019-2021)*



**“There are so many opportunities for improving sustainability. Sometimes it’s about the big things, such as building a new power plant. Sometimes it’s in the small things, like installing a bee hotel. That’s the beauty of it.”**

— Emmanuel, Director SHE

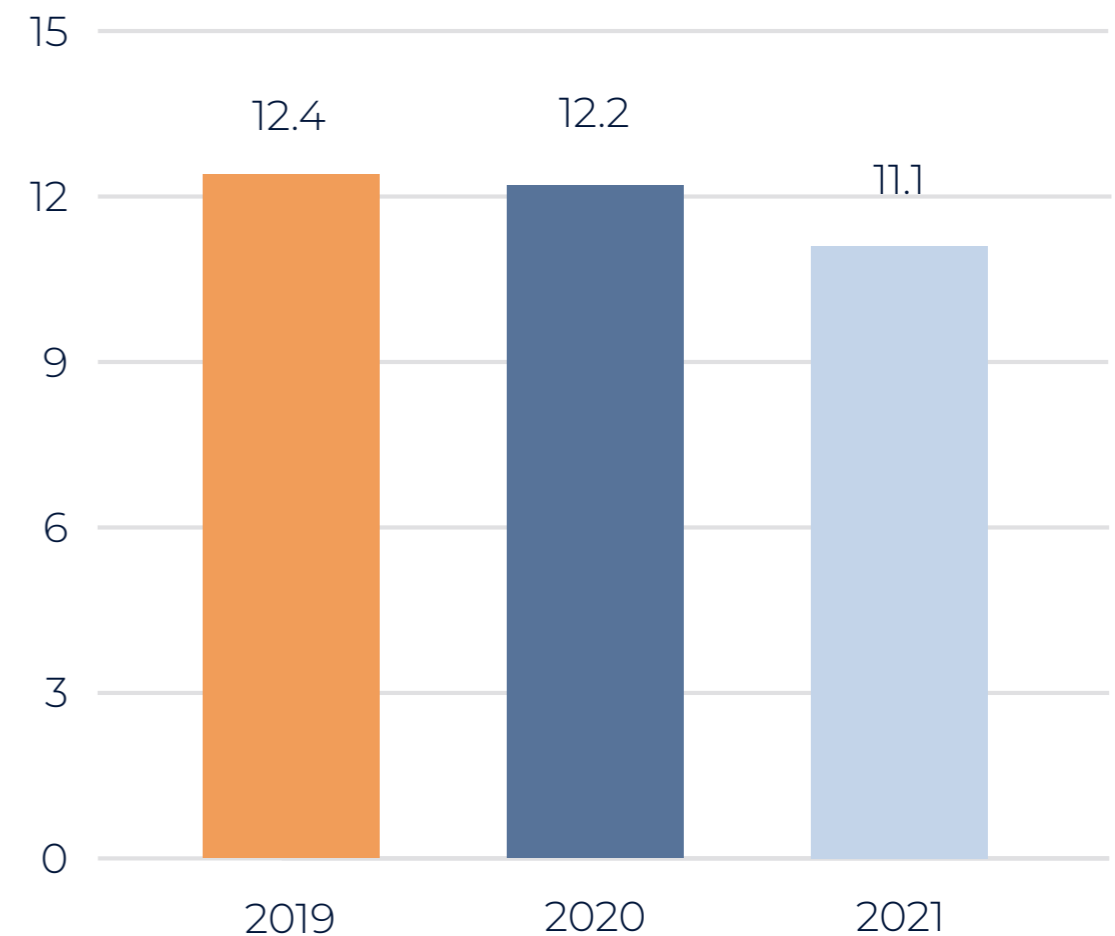
# Water

**Water is an essential resource in the production of citric acid. By optimising and reducing our overall water use, we aim to have as little influence as possible on our neighbourhood and the environment.**

We seek to conserve the natural water ecosystem in all its aspects, by recycling our discharge water and employing our biological wastewater treatment technology. As one of the few industries, we implemented the re-use of purified home wastewater into our cooling systems, and reduced groundwater uptake by over 50% in the past years.

As a next step, our new water treatment facility will purify used cooling water into process water and demineralized water. Hence, we further reduce our total use of groundwater and river water by 29% as from 2023, which amounts to 1 million m<sup>3</sup> per year.

To further support our circular mission, we encourage farmers to reuse our treated wastewater in times of drought.



*Water use in m<sup>3</sup> per ton of produced goods (2019-2021)*

# Safety

**Approximately 70% of our training programs are focused on health and safety, to continuously ensure that Citribel is a safe place to work, visit, and live.**

Our employees, partners, and visitors must be safe on our premises. Many variables are at work, including rigorous maintenance and reliability of our installations, adherence to operating procedures, a constant

focus on safety behaviour, and active promotion of a culture of responsibility. Approximately 70% of our training programs are focused on health and safety, to continuously ensure that Citribel is a safe place to work, visit, and live.

# Employee well-being

## **We endeavour to provide a comfortable working and living environment for our employees.**

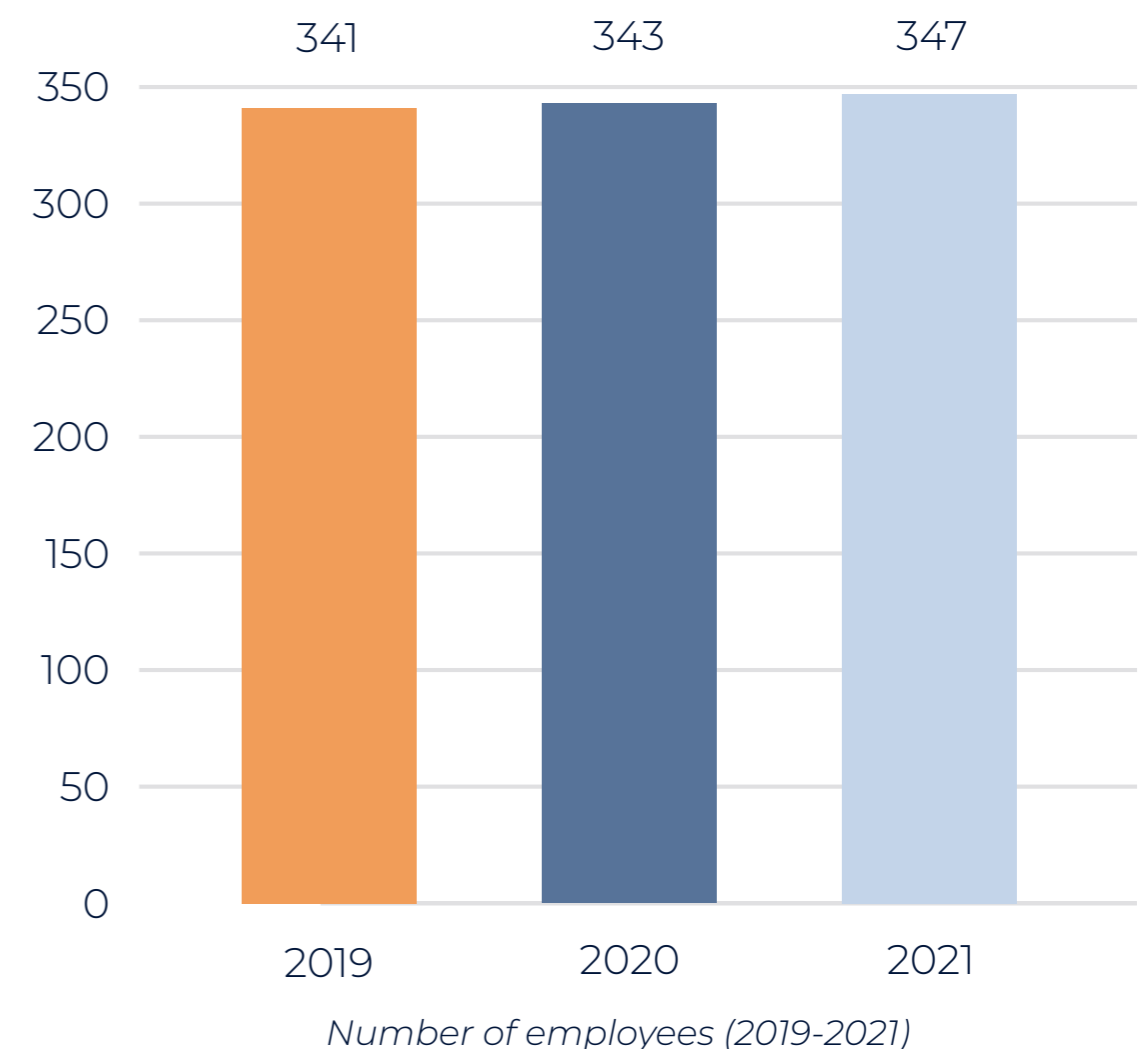
A collective labour agreement establishes the groundwork for agile work at Citribel, with a focus on mutual respect, ergonomics, medical check-ups, seamless on-boarding processes, a training and career strategy, and special attention for employees aged 55 and up.

We encourage our employees to buy an electric bike, play darts with co-workers, go to a yoga session, enjoy a group walk, participate in table tennis and table soccer tournaments, and engage in a

variety of other projects. We offer our employees the chance to take part in our health compass program, which includes free and comprehensive health advice as well as regular check-ups.

Continued learning and education is an important part of our culture. Apart from health and safety trainings, many courses are offered on a wide variety of subjects such as technical skills, leadership, financial and administration skills, etc.

The number of employees at Citribel remains very stable. About 94% of all employees have a permanent contract.





# Community

**Citribel is proud to be part of a vibrant community.** We appreciate the contributions of generations of culturally diverse colleagues and partners to the company. We value the collaboration between our company and the city of Tienen. Neighbours can reach us 24 hours a day, seven days a week, and there is a neighbourhood committee that meets at least twice a year. During these committee meetings, we openly discuss questions and suggestions for new projects, such as the use of our parking lot for the annual neighbourhood garage sale. We support Red Cross blood donations, poverty reduction initiatives, and litter clean-up efforts. We offer student internships on a systemic level and are frequently able to offer some of our interns a permanent position.



# Together with our partners

**Our processes serve as a daily reminder of our interconnectedness.** At Citribel, you can't help but realise that everything is linked: the molasses and the fungi, the company and its employees, the past, the present and the future. We highly value our ecosystem partners, which range from knowledge institutions to many reliable suppliers, and customers from all over the world. All of them are an indispensable link in our processes of innovation and circularity.





**“We sell our products worldwide,  
to customers in over 60 countries.  
Knowing that our product will finally  
end up in millions of households all  
over the world is a fantastic feeling.”**

— Ilse, Customer Service Manager



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