



# KIGALI FARMS

## Case Study



Carrier's cold chain solution helps East African farm significantly reduce food loss and operating costs



# TABLE OF CONTENTS

## Executive Summary

## Introduction

<b>1.</b>	<b>Background</b>	6
1.1	Meet Laurent Demuynck	6
1.2	Why Mushrooms?	6
1.2.1	Nutrition and Health Benefits	6
1.2.2	Simple, Cost-effective, Eco-friendly Farming	7
1.3	Why Rwanda?	7
1.3.1	A Favorable Climate	7
1.3.2	Vibrant People in a Land of Opportunities	8
1.3.3	Rwanda is Home to the Africa Center of Excellence for Sustainable Cooling and Cold Chain (ACES)	8
<b>2.</b>	<b>Kigali Farms</b>	9
2.1	The Social Enterprise	9
2.2	Button Mushrooms – Business Boosters	10
<b>3.</b>	<b>The Critical Issue</b>	11
3.1	Accessing a Market	11
3.2	Preserving Fresh Foods	11
3.3	The Tipping Point	12
<b>4.</b>	<b>Carrier's Cold Chain Solution</b>	13
4.1	Carrier's Support	13
4.1.1	Carrier – Customer-centric and Solution-driven	14
4.2	Teamwork	15
4.3	The Supra® 750	15
<b>5.</b>	<b>The Benefits</b>	17
5.1	"Zawadi" Magic	17
5.2	The Virtuous Circle	18
5.2.1	Reducing Loss and Improving Nutrition	18
5.2.2	The Ripple Effect	18
<b>6.</b>	<b>More Opportunities</b>	19

## Conclusion

## Executive Summary

A Carrier Transicold transport refrigeration solution has helped a well-known farm in Rwanda improve its cold chain and deliver fresh, nutritious produce to local and regional markets while significantly reducing food loss and operating costs.

Kigali Farms started growing oyster mushrooms in 2010 to provide sustainable income opportunities for small-scale farmers in Rwanda, help fight malnutrition and create local jobs. The business later expanded to produce button mushrooms that are packaged and shipped to Kenya.

Mushrooms are highly perishable and require constant temperature control during transport. Kigali Farms initially faced challenges with inconsistent results from various third-party transporters.

To overcome this, Kigali Farms invested in its own refrigerated truck equipped with Carrier Transicold's Supra® 750 unit, which offers constant evaporation airflow for controlled humidity, a robust design, high reliability and high-cooling performance. Developed for distribution environments with multiple door openings, the Supra 750 offers cold chain continuity – a necessity during mushroom loading and unloading operations, and during custom controls at border crossings. The unit also achieves superior pull-down and accurate temperature control at all set points.

Proper refrigeration, when combined with loading best practices and quality packaging materials, provides optimal performance and freshness. The changes Kigali Farms made helped immediately – the temperature of the mushrooms stayed stable throughout the first journey to Nairobi. Rather than being lost in transit, fresh, nutritious mushrooms could now be delivered to East African supermarkets and outlets, reducing food waste, supporting sustainability and encouraging increased agricultural diversity.

- Cold chain optimization
- Product loss cut to nearly 0%
- Business development

Today, the truck continues to operate in Nairobi delivering various types of perishables before returning to Kigali with fruit or third-party goods.

Carrier Transicold cold chain solutions and best practices tailored to the needs of Kigali Farms support Carrier's 2030 goal of helping customers avoid more than 1 gigaton of greenhouse gas emissions.

# INTRODUCTION

Carrier Transicold is committed to creating solutions that matter for people and our planet – now and tomorrow.

We offer innovative transport refrigeration solutions that aim to reduce loss, waste and environmental impact across the cold chain. We believe success can only be defined as such if it is shared by all its contributors. Beyond responding to short-term demand, we want to ensure viable sustainability for our customers, the economy and people – locally and beyond.

This case study is a powerful example of how Carrier's commitment to this vision, in close cooperation with like-minded collaborators, can trigger a virtuous circle of sustainable benefits. Meeting the needs of an ambitious and forward-thinking entrepreneur and providing him with cold chain control for the transport of his local produce opened the door to a realm of advantages, with benefits extending beyond his own business.

# 1. BACKGROUND

## 1.1 Meet Laurent Demuynck



### **Laurent Demuynck**, Chairman and Co-founder of Kigali Farms

Laurent is from Belgium, but has lived and worked in various countries, including Canada, the United States and Rwanda. He has a background in economics, finance, international relations and business administration. He started his career in banking and tech companies, then partnered with a Belgian beer company to run a US-based brewery for seven years. In 2009, he had a shift in mindset. Spurred by the urge to fulfill a business goal that would make “greater sense,” he decided to launch his own business – one that would benefit those who need it most. After three years of preparing for his project, Laurent left for Rwanda in 2010 to start Kigali Farms. He chose Rwanda for its favorable climate, business-friendly environment and vibrant people.

“With almost half our planet living under \$5.50 a day, I believe it’s our responsibility to help others share in the abundance, as much as it is our responsibility to respect the planet while doing so.” – Laurent Demuynck

## 1.2 Why Mushrooms?

Laurent envisioned a business model that would positively impact society by addressing the nutritional and financial needs of marginalized communities.

### 1.2.1 Nutrition and Health Benefits

Mushrooms are nutritious and offer a variety of health benefits. They are rich in protein, fiber, antioxidants and minerals while being a low-calorie food. They have lower crude protein levels than meat, but higher levels than most other foods. Mushrooms have a delicate flavor and a meaty texture, which makes them an affordable alternative to meat in many dishes. This is especially beneficial for people living in areas where animal products may be scarce or expensive.

## 1.2.2 Simple, Cost-effective, Eco-friendly Farming

Mushrooms are easy and inexpensive to grow, and they have a low environmental impact. They do not need arable land, special light or large amounts of water to grow, and they do not compete with plants for resources. They can be cultivated on various organic substrates, such as agricultural waste, straw, sawdust, paper or coffee grounds, which would otherwise be discarded or burned. By converting these substrates into edible mushrooms, they also contribute to reducing waste and greenhouse gas emissions.

*"While most grains and especially livestock demand major amounts of land and water to grow and feed, mushrooms are quite the opposite," explained Laurent. "They don't photosynthesize; they happily transform indigestible agricultural waste or by-products into nutritious food for humans and compost that returns to the soil."*



Mushrooms are a highly productive crop with a short lifecycle. They can yield up to 500 kilograms per year on only 4 square meters of land. In contrast, wheat or corn in Rwanda can produce 2 to 3 tons per year on 10,000 square meters.

*"You can't beat mushrooms in terms of protein per square meter, an important consideration in a densely populated country with limited land per capita," explained Laurent.*

Mushrooms can be grown by anyone from small farmers to large companies with proper training and education. Not only are mushrooms a source of food, but they also make a by-product while growing, spent mushroom substrate, which can be used as fertilizer or extra income for the farmer. Mushrooms are eco-friendly and profitable crops that create jobs. Laurent saw this as a "business that makes sense."

## 1.3 Why Rwanda?

Laurent was already familiar with Rwanda as a student, and he saw the potential of the 'Land of a Thousand Hills' for various reasons.

### 1.3.1 A Favorable Climate

Rwanda is a small country in the Central African region of the African Great Lakes, surrounded by Uganda, Tanzania, Burundi and the Democratic Republic of Congo. The country lies just 2 degrees below the Equator and has a mostly hilly terrain, which gives it a relatively mild to warm climate with daytime temperatures around 25 degrees C and nighttime temperatures around 15 degrees C, along with two wet seasons and two dry seasons each year. Although mushrooms do not need as much land as many other crops, climate does have an important impact. Rwanda's Northern hills, located above 1,800 meters, offer cool temperatures throughout the year and the kind of moist humidity in which mushrooms thrive.



### 1.3.2 Vibrant People in a Land of Opportunities

French and English are official languages of Rwanda and are spoken throughout the country, along with Kinyarwanda. The country is the fifth most densely populated in the world (over 12.6 million in an area the size of Belgium), with a young population (50% are under 20), and it is mainly rural. Despite its troubled history, marked by ethnic conflict and violence, Rwanda's Republic has been peaceful since 1994 and now ranks as the 9th safest country in the world.

The country has two airports (including Kigali International Airport) and a good road network with approximately 1,210 kilometers of paved roads. The government spends 10% of its annual budget on transport and other infrastructure to support a dynamic private sector and reduce transport costs for everyone. Rwanda is generally friendly to investors and has been called an emerging tech hub for Africa, with an increase in start-up companies.

### 1.3.3 Rwanda is Home to the Africa Center of Excellence for Sustainable Cooling and Cold Chain (ACES)

Rwanda's journey toward sustainable agri-business led the country in 2022 to establish the Africa Center of Excellence for Sustainable Cooling and Cold Chain (ACES). ACES works with governments, industry, academia, communities and other stakeholders to provide comprehensive, one-stop technical assistance and knowledge transfer for cold chain solutions. The first-of-its-kind center is dedicated to sustainable, smart cold-chain, cooling and post-harvest management (PHM). ACES is hosted by the University of Rwanda in Kigali in collaboration with Rwanda Polytechnic (IPRC).



Inauguration of ACES' first course and agreement signature with Carrier, March 2024, Kigali, Rwanda. From the left to the right and from the top to the bottom: **David Hill**, Director, Strategy, Communications and Private Office at Department for Communities and Local Government, **Dr Jeanne d'Arc Mujawamariya**, Minister of Environment in Rwanda, **Walid Kaddachi**, Strategic Development Director Africa, Carrier Transicold EMEA, **Carole Gwiza Biruta**, UNEP U4E - ACES, Finance and Contracts Management Specialist.

ACES brings together multi-disciplinary expertise and commercial partners, including Carrier, to collaborate on innovative solutions.

Rwanda offers a collaborative environment, a conducive business climate and, most importantly, people who can benefit from and contribute to sustainable agri-business.

## 2. KIGALI FARMS

Smallholder farmers are responsible for 75% of Rwanda's agricultural production. That's why Laurent saw a business opportunity in helping them grow mushrooms in Rwanda, which would provide them with income and nutrition, while also being beneficial for the environment.



Kigali Farms, Musanze, Rwanda

### 2.1 The Social Enterprise

Kigali Farms was established in 2010. Its social mission is to create a sustainable business for smallholder farmers and to combat malnutrition at all levels.

The company makes the mushroom substrate that is needed to grow mushrooms, specifically oyster mushrooms. It contains the fungus itself along with its food and water supply. If the farmer takes care of it properly, this substrate can produce oyster mushrooms continuously for 12 weeks.

Kigali Farms sells this substrate to a network of growers, many of which are women who are new to mushroom farming. Kigali Farms builds the growing houses, trains them, and helps them start their businesses for free and offers support. The farmers can either sell their mushrooms themselves or sell them back to Kigali Farms who will sell them.





Oyster mushrooms growing houses and production, Musanze, Rwanda



Oyster mushrooms harvest

*“While we encourage producers to find their own customers, access to the market can be challenging,” said Laurent. “Our buy-back program therefore remains an attractive guarantee. Free assistance also makes sense both socially and economically, as successful farmers will remain good long-term clients for Kigali Farms.”*

## 2.2 Button Mushrooms – Business Boosters

Kigali Farms' oyster mushroom substrate provided a new source of income and healthier diet to many Rwandans. However, Laurent also needed to reach a larger and more profitable market to sustain his business. He decided to grow button mushrooms, which have a higher demand and value than oyster mushrooms, and to target the Kenyan market. However, to access this market, he faced a critical challenge: transport.



*“When I decided to grow button mushrooms in 2016, the Rwandan market was not ready for this product,” said Laurent. “The idea was to reach Kenya where the demand for this product existed, but where the offer was scarce.”*



Button mushrooms growing in Musanze, Rwanda

The company harvested its first button mushrooms at the end of 2016. And in 2017, even though it was expensive, Laurent started to fly his produce to Kenya, because there was no road transport at the time. The idea was to wait until the volumes justified transporting the mushrooms by truck. In the meantime, the mushrooms arrived in Nairobi and were delivered to the cold storage room of Kigali Farms' sister company The Great Mushroom Company, to be distributed to Kenyan outlets and supermarkets.

# 3. THE CRITICAL ISSUE

## 3.1 Accessing a Market

For a business, gaining access to a higher-density market that does not have your products can have an exponential effect on sales.

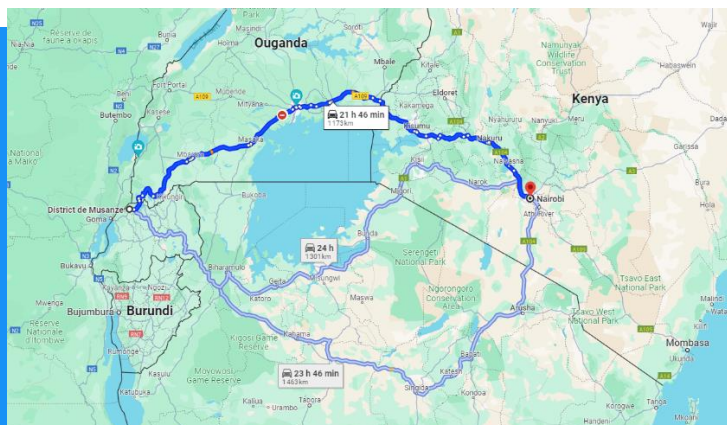
Rwandan mushrooms had the chance to sell very well in Nairobi, where demand for fresh produce was high. However, air transport was too expensive, so they needed another key factor: transport. Transport and storage are essential for market access in farming. Laurent had rented cold storage in Nairobi, but he still needed suitable, affordable transport for the mushrooms.

## 3.2 Preserving Fresh Foods

Mushrooms are very delicate and spoil quickly after harvest (7-14 days if kept cold, and only 2 days if not refrigerated). So, time and conditions of storage and transport play a critical role in this business. Mushrooms need to be kept at 0-3 degrees Celsius to stay fresh, because they produce heat after picking.

Mushrooms need to be  
kept at **0-3°C**  
to stay fresh

The demand for Kigali Farms mushrooms in Kenya grew significantly. In February 2018, Laurent found a transporter with a refrigerated truck and started shipping by road. The fastest route to Nairobi from Kigali Farms takes approximately 2 days (sometimes 3 days) and involves 2 border crossings (into Uganda and Kenya) and challenging roads.



Google map – Itinerary from Musanze, Rwanda to Nairobi, Kenya

The refrigerated road transport was expensive and to make it profitable, Kigali Farms had to store mushrooms (up to 4 days) while waiting for more to grow, until the truck could leave full (up to 4 tons). Therefore, the time and conditions in the truck were critical.

Throughout 2018, Kigali Farms shipped its mushrooms through its road transporter, observing irregular temperature logs in the refrigerated compartment and inconsistent results on mushroom quality upon arrival. The loading practices, road stops, door openings, refrigeration unit and temperature control did play a role – but at this point, Laurent had little knowledge of the cold chain, and refrigerated transport remained another expertise altogether.

By the end of 2019, a full truck left for Nairobi each week. Unfortunately, although the harvest was excellent, Kigali Farms experienced significant produce losses due to transport problems. Temperature logs varied over transport time and conditions were inconsistent within the refrigerated box.

### **3.3 The Tipping Point**

Kigali Farms faced many challenges due to the COVID-19 pandemic in 2020, like many other businesses around the world. Transportation was unreliable due to changing border restrictions, which affected Kigali Farms' transport provider. Various supply chain issues also reduced mushroom production. Exports stopped for three months.

In October 2020, Kigali Farms was ready to resume operations after COVID, but the company still relied on third-party refrigerated transportation. Unfortunately, at this time, the available options were either old or inadequate. The produce loss percentages became too high and frequent for the business to survive. Entire loads were 100% wasted twice when trying different truckers. Most transport vehicles in this region are imported worn-out secondhand trucks. The lack of control over the cold chain led to loss of revenue, loss of quality and loss of reputation, and was putting the business at risk.

Laurent made a bold choice: he would handle the transport himself. His whole business depended on having a reliable, controllable transport refrigeration system that would meet his needs.

## 4. CARRIER'S COLD CHAIN SOLUTION

Laurent wanted to buy a refrigerated container for easy and high-capacity transport, but he changed his mind and chose to invest in several smaller refrigerated trucks, starting with one. The first truck and refrigerated system would have to be new and highly reliable. Laurent found the truck through his local network and a bank was ready to fund the project, however he still had to find the refrigeration system.

### 4.1 Carrier's Support



**Ross Field**, Sales and Marketing Director at Field Mouse Enterprise / Specialised Fibreglass Ltd, Kenya

Ross Field has been Carrier Transicold's distributor in Kenya for more than 5 years. Since 1981, his company has specialized in the molding of high-quality fiber glass bodies for boats and vehicles, including insulated boxes for refrigerated transport.



*"Our company molds specially insulated containers for refrigerated trucks of all sizes. We ensure close attention to specifications and the quality of fittings and finishes to suit every client's specific requirement," explained Ross Field. "We were confident that Kigali Farms' truck, fitted with our box and equipped with Carrier's unit, would be able to deliver controlled refrigeration for the mushrooms, throughout their two-day transport and more."*



With his business at stake, Laurent needed the support of a cold chain expert to secure his investment in a robust, suitable refrigeration unit. He wanted to see if a unit and its technology could transport his perishable produce.

Field Mouse Enterprise / Fiberglass Specialized Ltd, Nairobi, Kenya



Ross therefore put him in contact with Eric Moussiegt, now former Business Area Director for Africa at Carrier Transicold.



**Eric Moussiegt**, Former Business Area Director for Africa at Carrier Transicold

Eric has more than 40 years of expertise in refrigerated transport, covering a broad spectrum of business transport requirements including in hot-climate, challenging areas of the world. He retired from Carrier Transicold in 2024.



*"When I started to exchange with Laurent, I knew immediately that the opportunity would be exciting. I share Carrier Transicold's customer-centric, solution-driven approach and strategy and place customers at the heart of everything I do. I love challenges and I was thrilled every day to accompany our dealers and clients in their cold chain activity and business in Africa," said Eric Moussiegt.*

4.1.1 Carrier – Customer-centric and Solution-driven



Carrier Transicold knows that customers need more than a good product to be satisfied. Carrier Transicold is a solution provider committed to reaching the highest standards in areas that matter most to its customers: accessibility, performance, uptime, responsiveness and, most importantly, expertise.

All of Carrier Transicold's high-performance cold chain innovations come from the same source: customers' needs. Carrier Transicold views each interaction as an opportunity to enhance its offering and refine its support. Each combination of transport conditions (long haul, city distribution or extreme climates) and product type (pharmaceutical, perishable, fragile or living products), requires a specific solution. To deliver the best solution for each business requirement, Carrier Transicold starts with listening.



## 4.2 Teamwork

In April 2021, Laurent contacted Eric. The situation was urgent.

*“To access his market and recover his business, Laurent’s produce had to stay fresh,” said Eric. “As a cold chain specialist, Carrier Transicold understands that ‘fresh’ isn’t simply a question of time spent in transport, but also about the conditions in which the produce is transported.”*

Laurent explained his farming business, transport constraints and goals in detail. He knew exactly what it would take to keep his mushrooms fresh in terms of temperature, humidity and timing.

*“To deliver the best possible solution, we ran an audit of how Kigali Farms grew, harvested, packaged, stored, refrigerated, loaded and unloaded the truck,” said Eric.*

The cold chain started at the farm – the mushrooms were cooled from 20 degrees Celsius at harvest to 2 degrees Celsius in a blast-chiller, then stored before transport, transported and stored again between 0 and 2 degrees Celsius upon arrival in Nairobi – but there was no real temperature control during transport. Also, there were many door openings during transport, including borders crossings.

Eric also gathered information on the airflow within the box, the type of packaging used for the mushrooms, how these packages were positioned in the truck and the size of the fiberglass box. Temperatures had to remain even throughout the box during transport and accessible through logs. Another issue also had to be solved: the top level of mushrooms tended to freeze – and go to waste – during transport.

After several days of close collaboration and listening, Carrier Transicold provided the solution to help Kigali Farms.

## 4.3 The Supra® 750

- Eric recommended that Laurent invest in a Carrier Transicold Supra® 750 unit: the perfect fit for Kigali Farms in terms of capacity (30 m<sup>3</sup>), autonomy and temperature range.



### Carrier Transicold Supra® 750

This refrigeration unit offers constant evaporation airflow for controlled humidity, a robust design, high reliability (even during truck failures) and high-cooling performance. Developed for distribution environments with multiple door openings, Supra 750 offers cold chain continuity – a great asset during mushroom loading and unloading operations but also during custom controls at the two border crossings. Perfectly adapted to the dimensions of Kigali Farms’ truck, it also achieves superior pull-down and accurate temperature control at all set points.

This performance is supported by a large range of evaporators with electric fans providing constant airflow independent of engine speed.

In other words, the mushrooms keep consistent temperature and humidity levels, regardless of the truck's speed, number of stops or even potential vehicle breakdowns. Autonomy is a prerequisite on Rwandan hills and long African roads where the unexpected, from floods to flat tires and accidents, can stop trucks for a long time.

The mushrooms keep **consistent temperature and humidity levels**, regardless of the truck's speed, number of the stops or even potential vehicle breakdowns.

*"To avoid the 'top freezing effect,' we suggested to further enhance the equipment with output air sensors, in addition to return air sensors," said Eric. "This allows temperatures to be even more constant throughout the mushroom load and over the entire transport period."*

Carrier Transicold's Supra refrigeration unit range also demonstrates a robust design both for aesthetics and components to extend the unit lifetime and reduce downtime. Maintenance time is also optimized thanks to easy accessibility – yet another advantage for this first investment.

*"Ross and I liaised closely to ensure that the truck's equipment technical criteria would meet the customer's existing and potentially future temperature control requirements," said Eric.*

Kigali Farms received the new truck in December 2021, fitted with Specialised Fibreglass Ltd' box and Carrier's Supra 750 unit.

# 5. THE BENEFITS

## 5.1 “Zawadi” Magic

“Zawadi” means “gift” in Swahili, and it’s what Kigali Farms named its custom-designed truck with its mushroom-specific refrigeration system.



**Zawadi**, the fully equipped temperature-controlled transporter for Kigali Farms in Rwanda

- Began operating in February 2022.
- Fitted with 30m<sup>3</sup> fiberglass refrigerated box.
- Features a Carrier Transicold Supra 750 unit.
- Operates Nairobi-Kigali shifts, weekly.

Kigali Farms’ teams followed Carrier Transicold’s recommendations in terms of loading and door openings and monitored the temperature via a cabin-command. With newly implemented temperature settings and improved loading practices, the load stayed stable throughout the journey, resulting in 0% discard upon arrival in Nairobi.



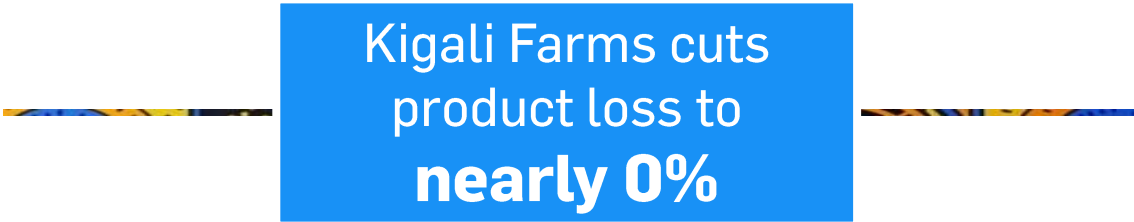
The truck was sized to bring more than 2 tons of mushrooms to market on each trip. This was intentionally less than the third-party trucks.

With Carrier Transicold's Supra unit, the refrigerated truck immediately proved how temperature-controlled equipment helps increase the storage life of produce – enabling optimized transportation across long distances, regardless of road quality, climate concerns or unexpected conditions. In other words: enabling market access.

## 5.2 The Virtuous Circle

Through his investment, Laurent and Kigali Farms saw the benefits. And they reached far beyond just mushrooms.

### 5.2.1 Reducing Loss and Improving Nutrition



Kigali Farms cut product loss to nearly 0% in a very short time – demonstrating that a connected cold chain, coupled with best practices for loading, door openings, product use and storage, can significantly reduce food loss.

Instead of being lost in transit, fresh, nutritious mushrooms can be delivered to African supermarkets and stores, improving human health and dietary patterns, and promoting more agricultural diversity.

### 5.2.2 The Ripple Effect

Carrier Transicold and Kigali Farms changed a loss into a gain. A connected cold chain saved Laurent's button mushroom business, which in turn supports Kigali Farms' oyster mushroom project for smallholder farmers in Rwanda. Success generated from one business helps another to fight food insecurity and malnutrition.

The virtuous circle takes us back to the original goal: a business that makes sense.

## 6. MORE OPPORTUNITIES

With Carrier Transicold's Supra 750, Kigali Farms' temperature-controlled truck now comes back from Nairobi to Kigali every week with fruit or third-party goods, enough to pay for the costs of operating the route. This creates a lot of potential for other businesses who want to transport their products on this road. In one example, the truck brought back ice cream, after Laurent confirmed with Eric that the Supra 750 and volume configuration could guarantee safe transport at negative temperatures.

*"With Carrier Transicold's solution, we went from 20% waste to nearly 0% waste within no time. It was a miracle," said Laurent. "The temperature was absolutely constant throughout the journey and our mushrooms arrived in perfect condition, eliminating our waste. The profits we are able to make from the return trip with other goods pays for the costs of operating our own truck, so our transportation costs went from \$100,000 a year to zero dollars a year."*

## CONCLUSION

The Kigali Farms case study demonstrates how accessing a market thanks to efficient refrigerated transport and effective teamwork can drastically reduce food waste and exponentially boost sales – turning a jeopardized business into a thriving one. This has a positive effect on other areas: from waste reduction to improved farming and local nutrition, from cold chain expertise and employment to new business opportunities across African borders.





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