

COOLING INNOVATION CASE STUDY

Natural Offset Farming

Overview

Nearly one-third of food produced globally is lost or wasted, with fresh fruits and vegetables among the most vulnerable commodities. Produce deteriorates before reaching consumers due to fragmented logistics, long transportation routes, high temperatures, and limited access to reliable cold chains. While traditional approaches to cold storage remain essential, they are often expensive, energy intensive, and difficult to deploy across fragmented agricultural supply chains.

Natural Offset Farming (NOF) is taking a complementary approach. NOF provides a short, targeted post-harvest treatment that extends freshness, reduces spoilage, and gives supply chain actors greater flexibility without requiring continuous refrigeration. The company operates a "Treatment-as-a-Service" model, allowing aggregators, exporters, retailers, and other supply chain actors to adopt the technology without significant upfront capital investment.



The Challenge

Food produce often passes through multiple intermediaries before reaching consumers, with heat exposure and inconsistent handling reducing quality. The result is lower farmer incomes, higher food waste, and reduced food availability.

NOF recognized that many supply chains often need a practical intervention immediately after harvest that provides just enough additional shelf life for produce to successfully reach its intended market. As NOF describes it,

our objective is not simply cooling; it is applying "the right treatment, at the right time, in the right location, for the right crop."

The Solution

NOF's patented treatment technology combines cooling through controlled CO₂ atmosphere and crop-specific protocols. These create an active preservation layer that slows natural deterioration following harvest. This intervention early in the supply chain may add from a week to 30 days of additional commercial shelf life.

The technology is intentionally modular. It can be deployed at aggregation centers, packing houses, exporters, retailers, logistics hubs, or integrated into existing facilities without requiring extensive infrastructure investments.

The company complements its technology with proprietary software that controls treatment conditions, captures operational data, and enables optimization.

World Bank Group's Role

WBG partnered with NOF through a multi-year support for commercialization and market expansion. With the support of the UK Government's International Climate Finance (ICF) and the Ayrton Challenge, WBG provided catalytic grant financing through the TechEmerge Program. Beyond grant financing, WBG has helped the company translate its technical innovation into a structured commercialization strategy by establishing measurable milestones, implementation plans, and partnerships. WBG's support has also enabled NOF to expand into new markets through TechEmerge matchmaking and strengthen partnerships with key agricultural stakeholders. The collaboration helped the company refine its business model, structure commercial agreements, and focus on measurable client outcomes — all critical steps for scaling an early-stage climate technology.

- [Learn more about UK's ICF.](#)
- [Learn more about TechEmerge.](#)

The Business Case: Creating Value Beyond Shelf Life

NOF measures success not simply by additional storage days, but by the commercial value created throughout the supply chain. In one representative client case:

Impact	Value Created
Yield recovery through reduced spoilage	10%
Higher quality retention	up to 3%
Greater logistical flexibility and timing	up to almost 2%
Total Added Value	up to 15% of crop value

The treatment itself represented approximately **4.2% of the crop's sales value**, generating an estimated **gross return on investment of 3.0–3.6x**.

Importantly, this ROI reflects only direct commercial gains. Clients have also reported additional benefits including:

- Lower product rejection rates
- Greater flexibility in marketing and pricing decisions
- Reduced electricity costs where cold storage requirements can be avoided
- Increased procurement capacity
- Improved customer satisfaction
- Access to more distant export markets due to longer shelf life



At a broader systems level, NOF estimates that reducing food loss can generate societal returns of **6–7 times** through avoided greenhouse gas emissions, improved food security, and more efficient use of land, water, labor, and transport resources.

Because crop economics vary significantly, returns are highest for products with high market value, high spoilage risk, strong quality premiums, and time-sensitive logistics.

Looking Ahead

NOF's next phase focuses on expanding from successful pilots to large-scale commercial deployment across India and other emerging markets.

The company is developing standardized treatment modules for aggregation hubs, in-transit logistics, and containerized applications while continuing to refine crop-specific treatment protocols using operational data collected from commercial deployments.

As demand for sustainable cooling grows, technologies that complement, not simply expand traditional cold chains, will become increasingly important. By reducing losses through targeted interventions, NOF demonstrates how innovation can improve incomes for farmers and other actors across the fresh produce value chain; strengthen food systems; reduce GHGs; and create commercially attractive investment opportunities.

The partnership between IFC and NOF illustrates how early-stage support, technical expertise, and strategic commercialization assistance can help innovative cooling technologies move from pilot projects toward scalable market adoption.

More Information

The Company's Profile is available through the TechEmerge Database of Innovators, the premiere site for finding cooling innovators from around the globe.

[See the Company's TechEmerge Profile here.](#)



Treated with NOF

Not Treated



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Not Treated

About the WBG Sustainable Cooling and Heat Resilience Initiative

The World Bank Group's Sustainable Cooling and Heat Resilience Initiative is a "five by five" strategy, addressing cooling in the **five sectors where it's needed most**: 1) built environment, 2) manufacturing, 3) agribusiness and cold chains, 4) health and education, 5) transportation and infrastructure.

The Initiative accomplishes this through **five modes of engagement** designed to catalyze global action: 1) providing insights, 2) influencing decision-makers, 3) catalyzing innovation, 4) scaling up investment, and 5) creating impact through job creation and livelihoods for a livable planet. [Learn more here.](#)

The Initiative is comprised of several targeted programs across the WBG which address portions of the above "five by five" strategy. The Cooling Innovation Facility provides technical advice to investment clients looking to embed cooling into their operations, along with CapEx grants for piloting of innovative technology. The Facility is funded by the UK Government's Department for Energy Security & Net Zero.



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