

Cooling as a Service Case Study: CaaS Prize Winner ColdHubs Improves Cold Storage Access in Nigeria

By renting out cold storage space per crate at a daily rate, ColdHubs helps to eliminate the impact of food spoilage and improve small-scale post-harvest infrastructure, saving 20,400 tons of food from spoilage in 2019 alone.

Overview

ColdHubs Ltd. Was founded in 2015, pioneering their bespoke pay-as-you-store Cooling as Service (CaaS) model for smallholder farmers, retailers and wholesalers of horticultural produce. The project eliminates food spoilage due to lack of cold storage at key points within the food supply chain by deploying and operating robust off-the-grid cold storage.

By improving access to cooling and eliminating associated food waste, they can subsequently increase the income of farmers and retailers, uplifting and empowering local Nigerian communities – women in particular. This is achieved by allowing them to rent storage space priced daily per crate, at a price they can afford, and on a scale that makes sense to each of them.

ColdHubs is a social enterprise that designs, installs, commissions and operates 100% solar-powered walk-in cold rooms, branded as “ColdHubs”, in farm clusters, produce aggregation centres, and outdoor markets. The Hubs are to store and preserve fresh fruits, vegetables and other perishable foods 24/7, extending their shelf life from two days to more than 21 days.

About ColdHubs’ CaaS model

ColdHubs operates a simple pay-as-you-store model. Farmers and retailers pay 100 Nigerian Naira (equivalent of US\$0.50) to store one 20kg (44lbs) returnable plastic crate per day, inside the cold room. Hubs are operated by a female Hub Operator, who monitors the loading and unloading of crates, collect the fees, and a Market Attendant who builds relationships in farm clusters and markets.

ColdHubs owns all the equipment with the assets on their own balance sheet, removing this barrier for small-scale operators who cannot afford the CAPEX investment.

In terms of future installations, these will be financed with a mixture of grants and debt investment. “The ColdHubs have a quick payback on CAPEX and OPEX, so we are more interested in long term loans with very low-interest rates instead of equities,” explained Nnaemeka Ikegwuonu, Founder/CEO of ColdHubs.

REGION

Nigeria

YEAR OF IMPLEMENTATION:

2015-2019

SECTOR

Cold storage, refrigeration

RETROFIT OR NEW

New

PROJECT SIZE (cooling capacity)

3TR (10.6kW) per cold room

TECHNOLOGY

Monoblock Compressor Refrigerating System

REFRIGERANT

R290 (propane)



How does it work?



The cold storage process commences once the non-refrigerated trucks filled with fruits, vegetables and other perishable food arrive from the farms at the farm cluster's aggregation centers or outdoor food market with the intention of storing the goods. The Hub Operator then transfers the food from raffia baskets or bags into the clean returnable plastic crate. The crates are stackable, and each ColdHub can contain up to 150 of these crates.

First, the Hub Operator completes the customer's Storage Card. Each ColdHubs customer has a storage card that details their name; phone number; address and type of business. The Operator also completes the inside of the storage card detailing the commodity brought forward for storage, the number of crates for each commodity, the total number of crates and the total amount for storage. Each line of information must have the signatures of the Operator and the customer.

Then the Hub Operator issues a receipt for the cold storage cash payment to the customer. The Operator and the customer sign the receipts and the customer pays the Operator the due amount upfront. This amount is calculated based on the number of crates, the amount of storage per crate, and the number of days for cold storage.

After the first payment, the customer comes to pick up the stored crate and returns the crate again with the produce contained therein, paying once again to be granted cold storage entrance. Long-term, regular customers enjoy the privilege of paying only when they are coming to pick up their crates.

"The model works because it is very affordable and reduces the risk of spoilage on farmers, retailers, and wholesalers," explains Ikegwuonu. "It enables them to focus on their core competence (which is to sell fresh fruits, vegetables, and other perishable food), while leaving the technical element of making sure the food doesn't spoil within the duration of sales, to ColdHubs, which has the technical competence."



A look inside a ColdHub

Each Hub is made up of the following:

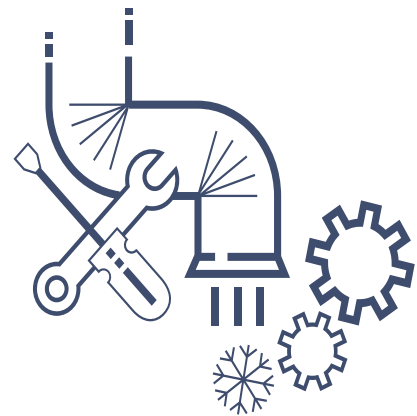
Cold room: Comprising 150mm (6") thick insulated cold room panels with a floor made of stainless steel. Dimensions (LxWxH): 3m x 3m x 2m (10ft x 10ft x 7ft). This contains approximately three tons of perishable food arranged in 150 units in 20kg (44lbs) plastic crates stacked on the floor.

Refrigeration unit: An energy efficient natural refrigerant-charged R290 mono-block refrigeration unit with 24/7 autonomous refrigeration, using 658W of energy per hour and specially designed for off-grid use. The temperature is kept at around 5°C (41°F).

Solar power: Provided by rooftop solar panels generating approximately 5.5kW, connected to a set of deep-cycle, long lasting batteries, off grid and on grid inverters. The power generated is sufficient to run the hubs on all weather conditions.

Natural refrigerants: The system uses propane (R290), which is a natural refrigerant with no Ozone Depleting Potential and a very low Global Warming Potential (GWP) – a sustainable and future-proof choice. According to ColdHubs, they haven't had any issues using R290. They take extra care in handling this and make it a priority to ensure that the Hubs are not installed in areas where there is any type of fire or open flame nearby.

Remote monitoring: Breakdowns and down-time is managed through the ColdHubs Advanced Remote Monitoring System (CARMS). On each ColdHub, there is daily monitoring of the number of door openings, battery state of charge, ambient temperature, cold room temperature, and solar irradiation. CARMS is being upgraded to have a video camera with capabilities of taking and storing pictures in the cloud, so they can see the loading and offloading of food remotely. With CARMS, the team manages and pre-empt the performance of each Hub.



Impact



ColdHubs is currently serving 3,517 farmers, retailers and wholesalers using its 24 installed cold rooms in 18 farms, aggregation centres and markets within the Southern and Northern Regions of Nigeria. 30 more ColdHubs are presently under construction across Nigeria, bringing the projected total number of Hubs to 54 by the end of 2020.

According to CEO Ikegwuonu: "ColdHubs has created enormous social impact."

The numbers speak for themselves. In 2019 alone, the 24 operational ColdHubs had the following impact:

- Increased the household income of 3,517 small farmers, retailers and wholesalers by 50%, an additional US\$60 (EUR50) to the previous US\$60 (EUR50) earned, making their monthly income a total of US\$120 (EUR100), simply by eliminating the previous 50% food loss.
- Created 48 new jobs for women, by recruiting and training them to work as Hub Operators and Market Managers in markets and farm clusters.
- Increased the quality of 20,400 tons of fresh fruits and vegetables, ensuring food safety by reducing exposure to harsh direct sunlight, chemical, bacterial and mycotoxin contamination, eliminating rapid rotting. Thus it made 20,400 tons of nutritious food available for local consumption.
- Saved an estimated 462,528kg of CO₂ emissions with an annual energy consumption reduction of 547kWh.



ColdHubs 2.0 coming soon

The company has just concluded the design of its second-generation ColdHubs named “ColdHubs 2.0”, which additionally features thermal storage to minimise their impact on the grid even further. The prototype will be ready by the end of 2020.

These new Hubs will take in an 8,000kg (17,637lbs) daily load of fresh goods, such as tomatoes, loading in the afternoon (from 12pm to 5pm) with a product starting temperature of 30°C (86°F).

The cold room size will be 10m x 6m x 2.8m (LxWxH) / 32.8ft x 19.7ft x 9.2ft and can be kept on temperature for three days during power outages without starting the backup generator (if no warm goods are loaded during this time).

The refrigeration system operates an average seven hours a day and offers a cooling capacity of 40-45kW (11.4-12.9TR) to keep the cold room temperature at 5°C (86°F). Energy is supplied exclusively by solar PV for 50% of the days in long-term average with a solar fraction of power supply greater than 80%.

CaaS Prize

In August, ColdHubs was selected as the winner of the CaaS Prize. To qualify for this prize, companies had to share information on implemented pay-per-use cooling/ outsourced cooling projects from Asia, Africa, or Latin America to show how the model works in application. The winners were selected by BASE, leaders of the CaaS Initiative, after reviewing the various entries from around the world.

“ColdHubs’ solution is a perfect example of how Cooling as a Service can overcome key barriers to adopt clean cooling technology,” says Thomas Motmans, Sustainable Energy Finance Specialist at BASE. “We want to showcase this success story because here is a large opportunity for its wider application in agricultural supply chains to reduce food waste and increase the quality and value of food for small- and medium-scale producers.”

