# Africa Centre of Excellence for Sustainable Cooling and Cold-chain

## Food saved is as important as food produced

**The Africa Centre of Excellence for Sustainable Cooling and Cold-chain (ACES) was established in 2020 by the Governments of Rwanda (GoR) and the United Kingdom, the United Nations Environment Programme's United for Efficiency (UNEP U4E) initiative, the Centre for Sustainable cooling, and a range of academic institutions. The Centre is hosted by the University of Rwanda (UR) at Rubirizi Campus. ACES is pursued through the Rwanda Cooling Initiative (R-COOL), a joint program of Rwanda Environment Management Authority (REMA) and UNEP U4E to advance the country's sustainable development priorities and ambitions for enhanced collaboration on sustainable cooling throughout the continent.**

ACES site in Rubirizi, Kigali, Rwanda

> *"Agriculture is one of the cornerstones of the Rwandan economy, and a comprehensive cold chain using energy-efficient and climate-friendly cooling solutions should be established"*
>
> *— Rwanda National Cooling Strategy*

### WHY IS THIS CENTRE NEEDED?

Despite significant investment into food production, hunger and under-nutrition are a persistent challenge globally and agricultural households in Africa have high levels of poverty. 80% of African farms are smaller than two hectares but they produce 70% of the continent's food. Over 70% of the Rwandan workforce is directly employed by agriculture, and this sector accounts for 1/3 of national GDP.

Farmers are losing between 30% - 50% of food produced for human consumption due to poor post-harvest practices and handling. Missing components are effective and integrated physical post-harvest management and market connectivity through a comprehensive cold-chain. Underpinned by accessible business models, the cold chain is essential to connect farmers to urban markets further afield for increased volume demand and higher price opportunities.

### SUPPORTING RWANDA'S AGRI-ECONOMY

The National Agricultural Export Development Board (NAEB) has a five-year strategy to double agri-exports by 2024-2025. It includes a nine-fold increase in high-value horticulture exports, as well as significant increase in other commodities such as aqua-culture, beef and produce dependent on the cold-chain.

A new wholesale market in the Kigali Special Economic Zone affords access to cold storage. However, the cold chain is limited from farms to the point of aggregation and export resulting in a loss of produce and quality.

### WHICH INTERVENTIONS ARE APPROPRIATE?

In the 'first mile' of food supply where the majority of post-harvest losses occur, perishable produce needs to be properly aggregated and processed. Challenges abound in establishing and maintaining a suitable cold-chain. Processes and equipment are typically energy-intensive and reliant on fossil fuel-based power generation and transportation, with refrigerants that often have a high climate impact.

New business models, financing, postharvest strategies and technologies should be deployed at nodes near farms, connecting them with markets near and far. There is significant potential for small farms to save food that previously have been lost, generating higher returns to the farmer and furthering poverty reduction more broadly.

ACES targets scalable solutions that bring economic and social benefits to countries with high proportions of the agricultural workforce composed of small and marginal farmers, while minimizing environmental impacts.

ACES connects local and international experts, investors, agri-food business, farmer cooperatives, and energy and logistics providers. Associated "Living Labs" in strategic locations and with particular areas of specialization across the continent will showcase how such solutions can be deployed in practical applications. The Living Labs exchange best practices and lessons learned through the ACES hub as part of an inter-connected whole.

## KEY GOALS

ACES will provide the applied research and dissemination, learning and teaching and industrial collaboration to advance the widespread adoption and uptake of energy efficient and climate friendly cold-chain solutions in agriculture and health sectors

- Turn food loss into sales
- Enhance access to nutritional foods in urban markets
- Develop new business opportunities with village-level resources.
- enable more effective roll-out of vaccines

## EXPECTED OUTCOMES

- Value addition to farmers, including new product opportunities
- New revenue sources for farmers and rural communities
- Circular economy benefits, leveraging waste to energy
- Reduce malnutrition and enhance food safety
- Mitigate climate impacts of new cooling capacity
- Sustainable business models attract uptake and investment
- Food cold chains integrated with other cold-dependent services such as vaccines, etc.

## MEASURES OF SUCCESS

- Increase value from production and "waste"
- Reduced post-harvest losses
- Increase throughput to new markets and food exports
- Increase in rural jobs
- Improve urban diets
- Minimise new $CO_2$ impact


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## APPROACH

Technical and business assistance by the joint team include:

- technology demonstration and capacity building in the field
- data acquisition and use
- a business incubator with full-service training, business model and support, skills development and innovation support
- sustainable low-carbon, pack-house and logistics design services
- renewable energy and e-logistics
- research on future-proof, localised solutions for food loss reduction and increased farmer income

These efforts are conducive to helping address broader cooling needs for medical and health cold-chains that are critical for pandemics, epidemics and natural disasters. A vaccine is one of the exit strategies to the Covid challenge around which scientists and government are aligned. Alongside the task to develop, test and manufacture vaccines, distribution for mass, rapid treatment is needed– likely in a cold-chain to protect the potency.

## PROJECT PHASES

**Phase I (Q3 2020 – Q1 2021): Conduct cooling needs assessment to provide foundation for the design concept of the Centre**

- understand and collate the drivers for cold chain service demands, localising down to farms (''first mile'') and consumers (''last mile'')
- identify deployment opportunities and barriers: socio-economic, e-commerce, cultural specificities, energy and infrastructure proximity
- prepare a full definition of economic, technical, systems, policy, and social considerations and impact wins to feed into the design

**Phase II (2021): Full design, technology and staffing definitions, and initial hiring and procurement of the Centre and an initial Living Laboratory**

Conduct economic, financial, energy, environmental analyses of different delivery and technology options as the basis for the design:

- identify the scale-up pathway, leveraging institutional and infrastructure dimensions, manufacturing and supply chains
- make technology selection choices fit for local markets
- consider engineering and industry knowledge, capacity and research needs and interests
- quantify the economic, societal and environmental impacts
- quantify the investment and financial ecosystem and policy, incentive and regulation requirements for long-term viability

**Phase III (2022): Set-up ACES and a Living Lab: Build, Commission and Start Operation of Key Facilities**

**Phase IV (2023 and onwards): Scale-up to pan-African Living Laboratories with demonstrations of ACES solutions in communities in numerous countries**

**www.unenvironment.org/news-and-stories/press-release/centre-excellence-rwanda-aims-support-african-farmers-and-rural**

**Additional research partners**

SRF The Centre For Sustainable Road Freight

Cranfield University