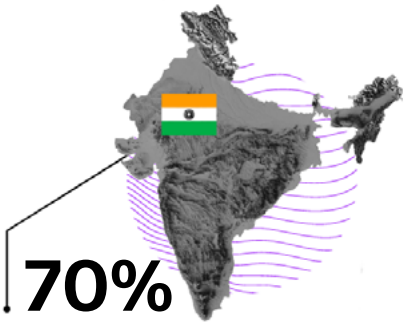

YOUR VIRTUAL COLD
CHAIN ASSISTANT

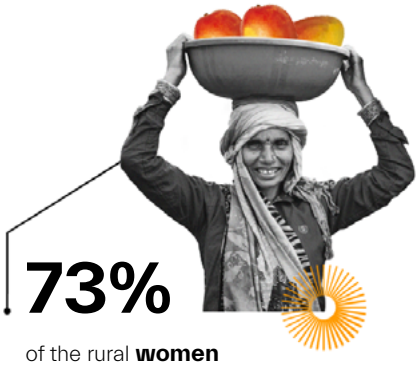
Context

AGRICULTURE PLAYS A VITAL ROLE IN THE INDIAN ECONOMY AND INDIA'S RURAL POPULATION IS PARTICULARLY DEPENDENT ON AGRICULTURE FOR THEIR LIVELIHOOD.



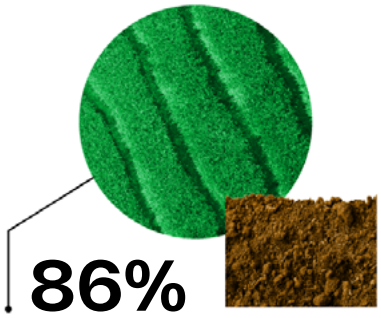
70%

of India's rural population are **farmers**.



73%

of the rural **women** workforce is part of the agricultural sector.



86%

of India's farmers are small holders with **< 2 hectares** of land.

YET, A THIRD OF PRODUCE IS LOST DUE TO LACK OF PROPER REFRIGERATION AND OTHER SUPPLY CHAIN BOTTLENECKS.

Climate friendly cooling technologies are available but deployment is limited due to lack of reliable access to energy, high-upfront costs, unavailability of proper maintenance, limited financing options and know-how.

90% DEFICIT OF COLD STORAGE FACILITIES

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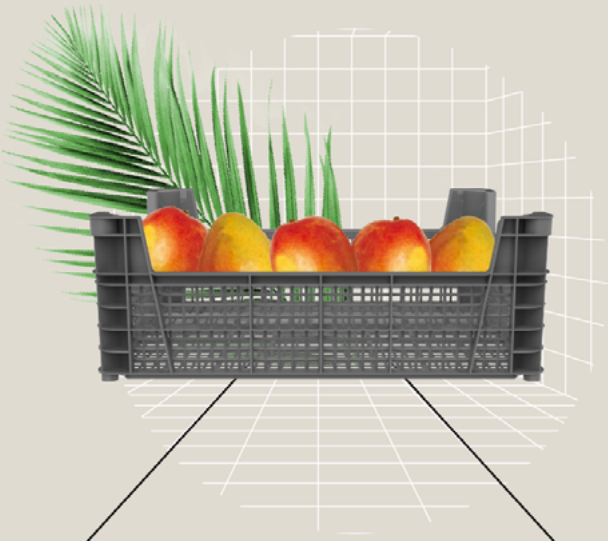


13 US $

billion worth of produce wasted annually

40

million tons of produce wasted annually

Context

BESIDES THE NEGATIVE IMPACT ON FARMER'S INCOME CAUSED BY THIS FOOD LOSS, FARMERS ALSO SUFFER INCOME LOSS BY BEING FORCED TO SELL THEIR PRODUCE AT LOW PRICES AT THE WRONG TIME DUE TO LACK OF ACCESS TO MARKET INFORMATION.

Most of the existing postharvest expertise solutions and market intelligence are closed-access and not inclusive of smallholder farmers in developing countries.

68% of the **crops** are sold **below** the market prices in India.

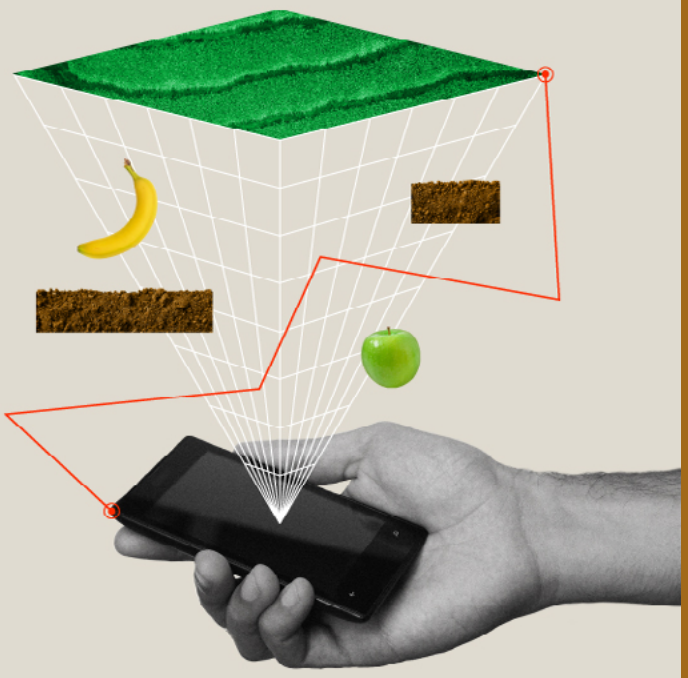
STRENGTHENING THE AGRI-CULTURAL COLD CHAIN AND ENABLING ACCESS TO MARKET INTELLIGENCE HAS TREMENDOUS ECONOMIC, HEALTH, AND ENVIRONMENTAL BENEFITS FOR FARMERS.

Solution

AS PART OF THE DATA.ORG INCLUSIVE GROWTH AND RECOVERY CHALLENGE, BASE AND EMPA ARE CREATING AN OPEN ACCESS, DATA SCIENCE-BASED MOBILE APPLICATION: YOUR VIRTUAL COLD-CHAIN ASSISTANT, TO ENABLE SMALLHOLDERS TO OPTIMISE THEIR DECISIONS ON PRODUCE AND FARM MANAGEMENT, AND TO GAIN ACCESS TO SUSTAINABLE COOLING.

Farmers gain access to the most efficient, reliable and sustainable off-grid cooling while only paying for the amount of food they store (per kg-day) in the cold rooms, avoiding any upfront investment.

Service providers own and maintain the cooling facilities, thereby covering he operational costs. This long-term commitment serves as an incentive for them to install the most energy-efficient equipment, and perform high-quality maintenance.



Solution

YOUR VCCA APP WILL ALLOW FARMERS TO MONITOR THE QUALITY OF THEIR CROPS IN REAL-TIME AND PROVIDE ACCESS TO TAILORED MARKET INTELLIGENCE TO MAXIMISE THEIR NET PROFIT, WHILE LEVERAGING THE EXTENDED SHELF LIFE ENABLED BY COOLING.

To do this, the project team will use various data inputs on weather, market volume and location, satellite images, fresh-produce yields, hygrothermal cold-storage sensors, forecasted remaining shelf life of produce, and real-time market prices. The app complements machine learning models with physics-based food quality modeling and will include the following components:

1.

Identify smallholder farmers that currently do not have access to cooling facilities and have the largest potential to adopt and implement our solution. This will be done with GIS techniques and machine learning models which leverage historical data on fresh-produce yields of smallholders in India, socio-economic indicators, satellite images, and distance from the grid and the market. We map these cross-disciplinary open data out in a GIS-based platform. This visualisation gives service providers and policy makers new ways for decision making in food supply chains.

2.

Predict the current quality of the stored food. A computer-vision powered application will assess the quality of the produce at harvest that is being stored in the cooling facility.

3.

Forecast remaining postharvest life for the current cold storage conditions. Physics-based modelling will be used at this stage, fed by data on quality at harvest and the measured temperature and humidity in the storage room, based on wireless sensor data transfer.

4.

Predictive market analytics. The app will provide the farmers with suggestions on the best time and place to sell the produce to maximise their net profit. This prescriptive model utilises forecasted market prices, distance to markets, stored produce quantities, cold storage and transportation costs, and – as a unique feature – the remaining shelf life of the produce in store.

Impact

YOUR VCCA WILL ENABLE SMALL-HOLDERS IN INDIA TO BREAK THE CYCLE OF POVERTY WHILE ALSO IMPROVING FOOD SECURITY AND MINIMISING THE IMPACT OF FOOD PRODUCTION ON THE GLOBAL CLIMATE.

BASE (Basel Agency for Sustainable Energy) and Empa (Swiss Federal Laboratories for Materials Science and Technology) are partnering with local entrepreneurs in India to pilot the tool with different types of crops, targeting 200 to 500 smallholder farmers. This two-year endeavour is projected to reduce food loss for smallholders by 20%, increase their yearly income by nearly 30%, and reduce greenhouse gas emissions by up to 50%. Reducing post-harvest losses also helps reduce related CO2 emissions, further amplified by removing the use of harmful refrigerants (such as R-22) and diesel generators from the cold chain. By ensuring that clean technology is used instead of fossil-fuel dependent technologies, that cost less upfront but are more expensive to operate, the impact on climate change is mitigated.

Benefit **200 - 500** smallholder farmers

Increase of yearly income by **30%**

Decrease of food loss by **20%**

Decrease of GHG emissions by **50%**

The project is funded by the data.org Inclusive Growth and Recovery Challenge. Launched in partnership with the Rockefeller Foundation and the Mastercard Center for Inclusive Growth, the Challenge aims to tackle society's greatest challenges and help people and communities thrive by harnessing the power of data science.

BASE Empa Materials Science and Technology data.org

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