

CASE STUDY 7

Tackling food loss and waste

Boosting farmer incomes with solar-powered post-harvest technologies

One-third of food produced is never consumed: this represents 8% of global greenhouse gas (GHG) and a quarter of the water used in agriculture, as well as crop-land the size of China. Strong business, social and environmental drivers to tackle post-harvest loss and food waste include reducing contamination loss across the key value chain stages from production to consumption, financial savings, resource use

efficiency, higher performance and contribution to climate targets, food availability and better returns on investments for actors involved.

WBCSD is collating this series of case studies to scale private-sector action that tackles post-harvest loss and food waste through fostering more knowledge-sharing and peer-learning.

Case studies are available at www.wbcspd.org.



Innovation for a more livable world

Covestro combines sustainability, innovation, and value creation to develop products and technologies that contribute to a more livable world—one that is environmentally-friendly, healthy, and efficient. The company's mission is to "Make the World a Brighter Place" and is guided by the long-term strategic vision of "Being Fully Circular."

Within Covestro Inclusive Business (IB), Covestro works in tandem with a diverse set of partners and stakeholders to bring about a 'sustainable social transformation' for underserved communities in alignment with the United Nations Sustainable Development Goals (SDGs). One of its approaches is tackling post-harvest loss in agricultural supply chains.

According to the Indian Ministry of Food Processing Industries, 15% of all fruits and vegetables are wasted post-harvest, which—in addition to the loss of nutrition potential for consumers—amounts to USD \$4.4 billion in lost revenues for farmers. The primary causes of this loss are poor storage and transportation facilities upstream in the supply chain. Through leveraging the IB consortium of partners to create a stronger post-harvest system, Covestro's Post-Harvest Solutions can add substantial value towards improving the livelihood opportunities for small and marginal farmers and tribal communities in the agricultural sector.

Tackling post-harvest loss to improve livelihoods and food security

Post-harvest food loss includes the degradation in quantity and quality of food along the supply chain, after the point of harvest. Nutritious horticulture crops have a relatively high moisture content, which increases their perishability and deterioration if not handled properly. In India, an estimated 12 million metric tons of fruits and 21 million metric tons of vegetables are wasted post-harvest annually. This loss negatively impacts the country's economy and food security. It also impacts the earnings of small and marginal farmers, which constitute 82% of rural households depending on agriculture for their livelihoods. In addition to the impact on income associated with product loss, poor storage facilities compel farmers to sell their produce at low prices soon after the harvest.

Solar dryers and cold storage technology for product preservation and value creation

To tackle this challenge, Covestro and its partners have developed innovative solutions, using polycarbonate and polyurethane materials.

The **Solar Greenhouse Dryer** uses an insulated UV-protected polycarbonate sheets to accelerate drying of agricultural products within the greenhouse. The safe, closed structure keeps nutrients intact for longer periods without affecting the natural color, aroma or texture of the produce. With a capacity to dehydrate a batch of up to 2,000 kilos of produce, the solar greenhouse dryer is suited for Farmer Producer Organizations (FPOs), and agribusinesses. It helps manage excessive harvests of seasonal crops, enhancing their value-addition capacities. Many marine products can also be preserved for three months to a year using Covestro's drying technology.

Other technologies that Covestro has developed to prevent post-harvest loss includes Covestro's **Solar Conduction Dryer**, which relies on conduction, convection and radiation for heat transfer to preserve 45% more nutritional value in fruits and vegetables than conventional dryers. In addition, the company's portable **Solar Cold Storage System** has a unique thermal energy storage technology that allows battery-free backup and can therefore be installed anywhere.

Innovations to protect bananas in Trichy, India

The impact of Covestro's technologies is demonstrated in how they were used to empower banana-producing farmers in Thottiyam, Trichy, India. The sweet banana grown in Trichy has a short shelf life and is sold fresh in the market at Rs 1.50 per fruit. Once over-ripe, these bananas are used as cattle feed, thus earning no revenue for the farmers. Fluctuating prices during the harvesting season further impacts revenues, and fruits are often ripened forcibly through external climactic factors which can also reduce farmer incomes. Suitable storing technology is necessary but often unavailable, further exacerbating the challenge for farmers.

When Covestro's polycarbonate-based Solar Greenhouse Dryer was introduced, the shelf life and value of the product increased. The solution offered Trichy's farmers an efficient and hygienic drying method that preserved the aroma, color and nutrients of the bananas, and also offered an alternate market for the farmers in the form of dehydrated products. When the over-ripe fruits are dehydrated using the Solar Greenhouse

Dryer, they can be sold in the market at Rs. 8 per fruit – an increase of Rs. 6.50 over the fresh product, which increases incomes five-fold.

In one example, Thottiam Banana Producer Group (TBPG) took up use of the solar dryer in 2014 to dehydrate bananas and improve shelf life. 13 TBPG farmers as well as 30-40 small and marginal farmers were impacted by its usage, earning a net profit of Rs 1,51,200 per season. The payback period of the drier was 2.5 years in this scenario; however the payback period varies by commodity and potential capacity utilization of the unit.

This initiative has since expanded beyond Trichy and across the entire southern region of India. The Government of Tamil Nadu has included Greenhouse Dryers in their subsidy program, given the impacts on livelihoods and also the significant reduction in GHG emissions, as the methane produced during putrefaction is prevented by dehydration.

Efforts to scale the technologies and sensitize stakeholders

Covestro's technologies have been further developed and scaled since launch. With over 1,300 Solar Conduction Dryers, 500 Solar Greenhouse Dryers and 140 Solar Cold Storage units installed, the company's footprint in India is growing steadily and improving livelihoods of over 100,000 farmers. Covestro aims to affect 10 million farmers by 2025.

Efforts are ongoing to sensitize value chain stakeholders like researchers, food processors, market linkage providers, government institutions, NGOs and farmers, to build a holistic roadmap to mitigate post-harvest losses at the farm level. For capability building, resources and financing are required to train farmers and food processing companies to develop the skills needed for handling post-harvest processes, and to procure technological solutions like the ones Covestro can provide.

Figure 1: Value addition across crops

COMMODITY	PRICE BEFORE USING SOLAR GREENHOUSE DRYER	PRICE AFTER USING SOLAR GREENHOUSE DRYER
Figs	Rs 55/kg	Rs 700/kg
Banana	Rs 1.5/fruit	Rs 8/fruit
Cocoa	Rs 120/kg	Rs 190/kg
Moringa	Rs 60/kg	Rs 160/kg
Coconut	Solar greenhouse dried coconut has increased oil yield by 10%	



ABOUT WBCSD

WBCSD is the premier global, CEO-led community of over 200 of the world's leading sustainable businesses working collectively to accelerate the system transformations needed for a net zero, nature positive, and more equitable future.

We do this by engaging executives and sustainability leaders from business and elsewhere to share practical insights on the obstacles and opportunities we currently face in tackling the integrated climate, nature and inequality sustainability challenge; by co-developing "how-to" CEO-guides from these insights; by providing science-based target guidance including standards and protocols; and by developing tools and platforms to help leading businesses in sustainability drive integrated actions to tackle climate, nature and inequality challenges across sectors and geographical regions.

Our member companies come from all business sectors and all major economies, representing a combined revenue of more than USD \$8.5 trillion and 19 million employees. Our global network of almost 70 national business councils gives our members unparalleled reach across the globe. Since 1995, WBCSD has been uniquely positioned to work with member companies along and across value chains to deliver impactful business solutions to the most challenging sustainability issues.

Together, we are the leading voice of business for sustainability, united by our vision of a world where 9+ billion people are living well, within planetary boundaries, by mid-century.

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