

# S4S TECHNOLOGIES

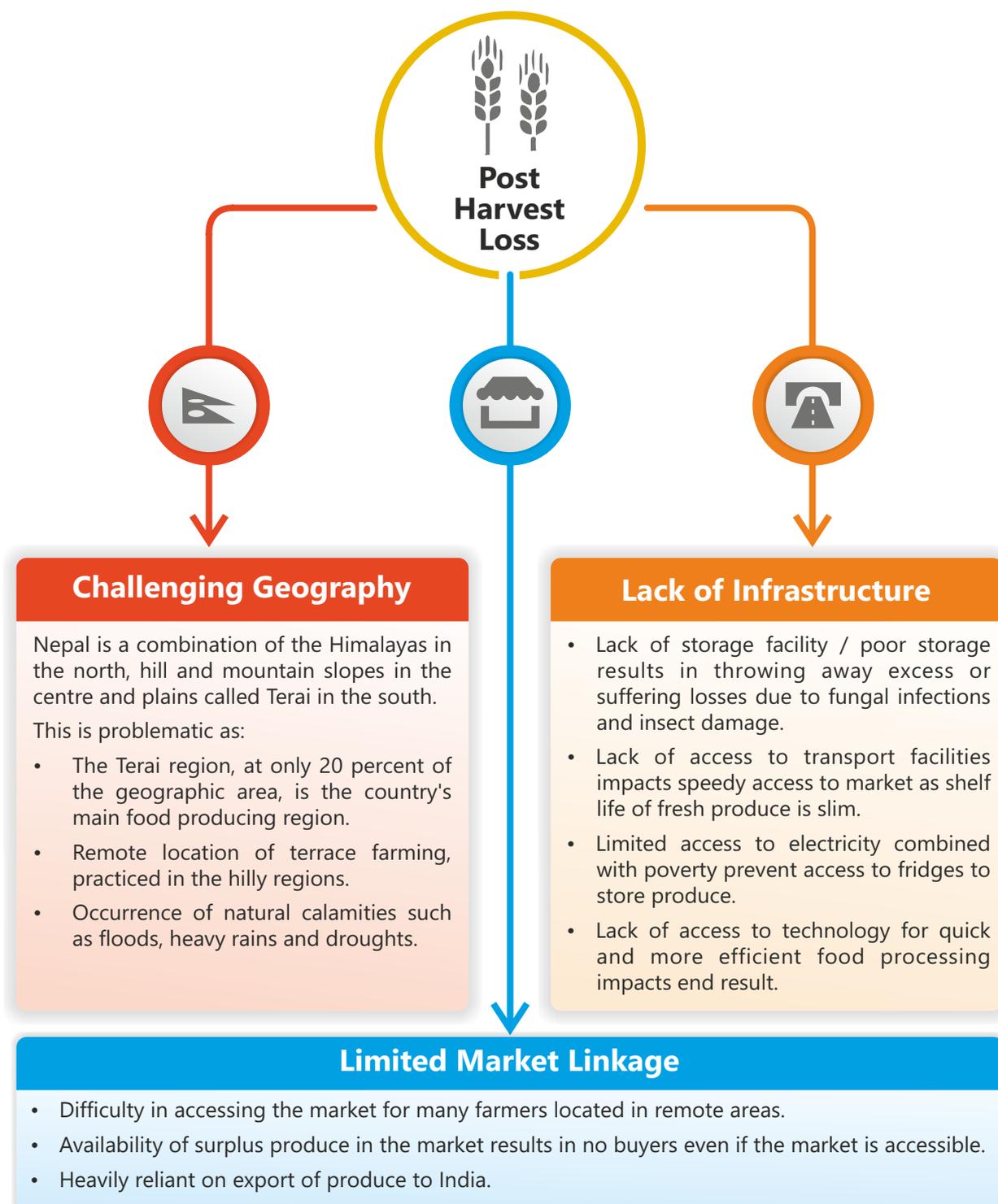
*Mitigating post-harvest loss and adding value through solar conduction in Nepal*



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Agriculture, more accurately subsistence farming, is the mainstay of Nepal's economy, comprising one-third of the nation's GDP and providing employment for two thirds of the population. Approximately 33% of the country's GDP relies on agriculture. The diversity of the country's distinct agro-ecological zones allows for growth of a wide range of cereals, vegetables, fruits and spices. Moreover, it is the source of livelihood for 76% of the population, of which majority are from rural areas. However, despite this, Nepal often faces a food security crisis. A key-contributing factor for this is the post-harvest loss. This loss, of between 20-50%, weighs heavily on the local small farmer who relies on agriculture for livelihood.

The causes of post-harvest losses in Nepal can be classified into three broad categories:



Raja Ram, a farmer living on the hills of Nuwakot, Nepal relies on the weather for a bountiful harvest, in order to support his family of five with less than an acre of land. However, owing to the nature of terrace farming, his entire land holding is fragmented. Coupled with limited access to transport facilities due to the remote location, inconsistent electricity and no technology to store his crop; he suffers heavy losses. "Last year was difficult. I could not sell ginger and a lot of my crop got spoilt and had to be thrown away. It was difficult for my family".

Due to the bumper crop of ginger, the market was already saturated and without a way to preserve the crop while maintaining quality, he could not earn a decent living. Small farmers like Raja Ram are impacted the most due to the post-harvest losses.

Understanding the glaring need of increasing food security in India as well as Nepal, Mumbai-based social entrepreneur Vaibhav Tidke, CEO of Science for Society (S4S) focused the organization's efforts at creating a low-cost, innovative, renewable, and environmentally friendly technology solution - the Solar Conduction Dryer (SCD). The project was initially supported by funding from BAYER and USAID who provided direct funding to bring SCD from lab to field. As a result, the SCD was introduced and successfully piloted in Maharashtra in 2014.

## The Innovation



The Solar Conduction Dryer (SCD) is an electricity-free solar-powered food dehydrator that reduces the moisture content in agro-produce so it can be preserved for up to one year without using any chemicals. It also provides the farmers an opportunity to earn additional income through the sale of dehydrated products. These products can be sold at high-value and also be used by the farmer families throughout the year. Mr. Ashwin Pawade, Partner, Lead Nepal Operations at S4S highlights that the SCD is a one of its kind patented technology in the world, which dries products using conduction instead of convection.

The Solar Conduction Dryer (SCD) has twin advantages, both in the technology itself and the process undertaken.

### Technology

It does not require electricity since it is solar-powered, filters harmful UV rays, maintains temperature at below 65 degrees to avoid roasting of the harvest and provides faster & more efficient drying than the traditional processes. Being portable, it can be installed hassle-free by the farmer once trained and runs on low maintenance and operation cost.

### Process

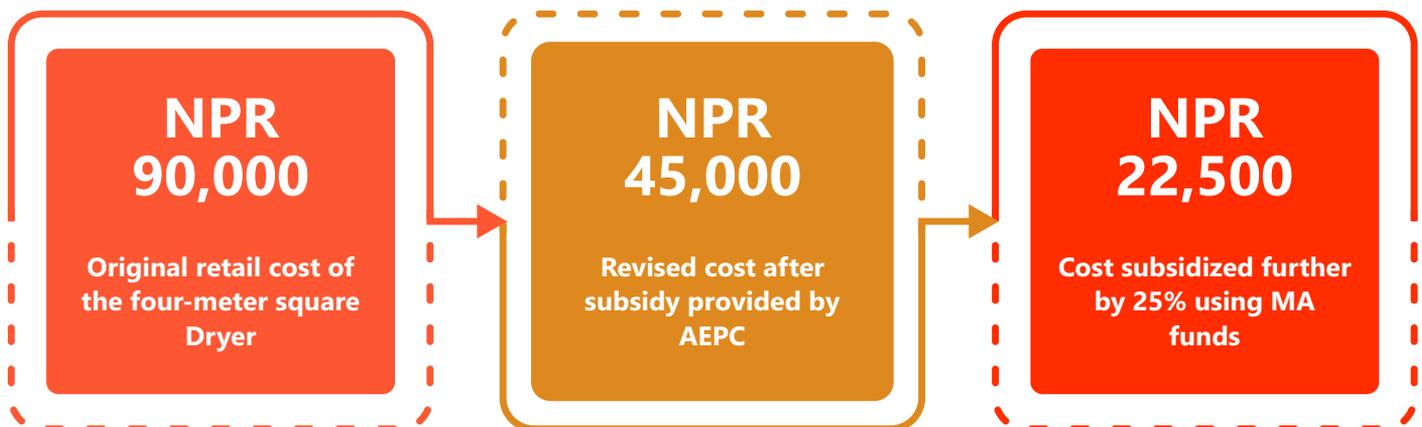
It has a minimal carbon footprint, involves in-situ processing to lock in freshness and nutritional value even in remote locations. It also allows dehydrated food to be preserved up to a year without chemicals, which can then be sold during off season at a higher value. Additionally, it empowers women by increasing their role in operation and management of the dryer.

## Intervention in Nepal

S4S began to grow and expand operations of SCD post its successful introduction in India in 2014. In 2016, they received feedback from farmers that if S4S were willing to start buying back (dried products), the uptake of the machine would increase, and scaling would speed up. This would also enable greater market linkage. Subsequently, S4S started buying back food products from farmers and selling them under the 'DesiVDesi' brand.

Aspiring to expand in other countries and regions where the need for this renewable energy-based product innovation was the greatest, S4S sought support of the Millennium Alliance (MA) platform and received funding in 2016. The funding was for 250,000 Pounds (or approximately INR 2.25 crores) for a period of three years ending June 2019. The objective of the funding was to replicate and scale the use of the SCD and help farmers in Nepal. This ideology perfectly aligned with the vision of S4S and the funds received from MA proved to be the push necessary to bring SCD into Nepal for the first time.

To implement the project in Nepal, S4S Technologies collaborated with a local partner, Astha Engineering, for spreading awareness within the community about the Solar Conduction Dryer. They also received support from the Alternative Energy Promotion Center (AEPC), the renewable energy wing of the Government of Nepal in the form of a subsidy, varying between 50 – 75 percent depending on the region. The subsidy was made available for 500 SCDs imported to Nepal. This tripartite relationship proved to be the right mix, necessary to carry forward the joint vision of S4S and MA.



The dryer sold by S4S is a four-meter square dryer, which was originally retailed at NPR 90,000. However, due to the subsidy provided by AEPC and MA funds, the cost was brought down to NPR 22,500 making it very attractive to Self Help Groups (SHGs) and Farmer Producer Groups (FPOs) in the region.

### The case of ginger in Nepal (2017)

Fresh ginger is sold at a rate of NPR 20 per kg in the local market in Nepal. The conversion of fresh to dried ginger is in the ratio of 6:1 i.e. 6 kg of fresh ginger is equal to 1 kg of dried ginger. Hence, the total cost of 6 kg of fresh ginger or 1 kg of dried ginger stood at NPR 120 in the market. As part of its buy back policy, S4S bought 1 kg of dried ginger for NPR 250. Therefore, the gross profit for the farmer is over 100% at NPR 130. Ashwin went on to state that even including NPR 60 for labour cost and capital cost of using the dryer, the local small farmer still earned a net profit of NPR 70 more than the market price of 6 kg of fresh ginger.

### The Impact

Since its inception, the project has made substantial impact in Nepal. The S4S and Astha teams have visited over 80 locations across the length and breadth of the country in order to spread awareness among the community about the benefits of the SCD.

Impact	India	Nepal
Geography covered	24 states	18 districts
Total SCD active	2700	274* (Now increasing capacity with new R&D intervention)
Total beneficiaries/households covered	2,260 (all women)	500 (110 Men and 390 Women)
Percentage (%) increase in income observed	30%	35%

Bhawani and Tez Raj Pandey is an elderly couple whose main source of income is derived from agriculture. Within three months of using the SCD, they have seen an increase in their income. "Before the dryer, everything extra we produced, that was not consumed, was distributed away. But now we have slowly started selling the dried products in the market."

Today, for every kilogram of dried bitter melon, they earn NPR 300 at the local market. Bhawani also mentioned that during off-season, they can sell the dried produce for three times as much, as "storage is no longer a problem because dried produce takes very little space".



There has been a general consensus among the community that the use of the dryer has increased their income, however, the increase is varied depending on the type of product, season and existing market value.

Another positive long-term benefit of the use of the SCD has been access to diverse food products. Farmers in harder to reach areas no longer have to rely on receiving fresh produce and can source the same health benefits from consuming dried produce. This allows the locals to diversify their diet with other nutritious food staples as well.

## **Sustainability and Forward Linkages**

While the technology successfully enabled farmers to overcome the challenges relating to geography and infrastructure to some extent, limited market linkage remained a matter of concern. To address this concern, Astha has registered "RashanPani", a sister organisation to help promote the small-scale farmers. The organization gives an assurance to the farmers of buying their dried products at a fair market price and selling them in the urban cities of Nepal. This model was developed along the same lines of S4S's "DesiVDesi" brand, which provides market linkage to farmers in India by buying- back their dried product. The aim behind this model is to provide a long-lasting and sustainable market to small farmers who have difficulty accessing or selling at the local market.

The DesiVDesi brand of S4S is a core component of their business model. The sale of the dryers in Nepal does not contribute to the profit margins and long-term sustainability of S4S directly, rather, according to Ashwin, "We are just about breaking even in Nepal (regarding sale of dryers). Our profit comes from the sale of the dried produce sourced from farmers under our DesiVDesi brand".

To enable scaling of their innovation, S4S aims at making SCD available at the most cost-effective price to the farming community in Nepal. For this, subsidy provided from AEPC is essential. Ashwin believes that after reaching the 500-dryer mark, they will look to renew their relationship with AEPC again with further subsidies to enable them to scale effectively and efficiently in the country.

Currently, Astha is also exploring the vendor financing model with the United Nations Capital Development Fund (UNCDF) to buy machines from S4S and then sell to farmers in Nepal. This new type of financial mechanism has strengthened the partnership to serve the Nepalese market. Additionally, S4S has also worked with the Astha team to develop new solar dryers, which have electrical back up and work in high altitude areas of Nepal and the Himalayan regions.

Post the Millennium Alliance award; Nepal is now the fastest growing market for S4S today. Partnership with MA has not just allowed S4S to enter and expand its activities into Nepal, but according to Mr. Vaibhav Tidke, CEO, S4S Technologies, "MA support has been very useful for us to create an impact and networking among our partners."

The SCD is now present in 13 countries, namely India, Nepal, Bangladesh, Bhutan, Thailand, Philippines, Sri Lanka, Cambodia, Kenya, Rwanda Malawi, Uganda and France. It has also been greatly featured in leading media outlets like Forbes, DBS Asia, VC Circle and Mint.

## Funding Raised

In addition to the Millennium Alliance, S4S Technologies has additionally leveraged a total external funding of \$1.78 Million for the Solar Conduction Dryer (SCD).

### Cumulative external funding leveraged for SCD (India + Nepal)

Source of Funding	Amount (USD)	Type	Objective
<b>External Funding leveraged for SCD (India)</b>			
Powered Program	285,000	Grant	Build systems & scale
FactorE Ventures	700,000	Equity	Build systems & scale
CASEE	700,000	Grant	Build systems for scaling up
<b>External Funding leveraged for SCD (Nepal)</b>			
Shell Foundation	100,000	Grant	New hardware R&D to suit to Nepal climate

### Overall Impact of the SCD in India & Nepal (till December 2019)

**20,100 Tons**

Food losses saved

**2,01,000 Tons**

CO<sub>2</sub> saved

**20,100 Tons**

year Capacity noted at the farm level solar food processing

**20,00,000**

Population supplied with nutrition-rich food

**30,000+**

Farmers impacted

**2,50,000**

People supported under nutrition awareness

**2,700**

Women farmers employed directly

**30,000**

Reproductive women noted improvement in haemoglobin profile

**\$1,000 - \$1,200**

Observed increase in income of women farmers

