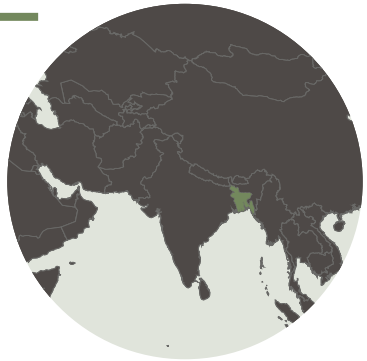
SOLAR MILK COOLING IN BANGLADESH

Off-grid clean energy solutions for rural milk collection centres

REEEP

BASIC FACTS



Location:
Bangladesh

Implementing Agency:
Enerplus

Grant funded by:
Ministry for Sustainability and Tourism, Austria

THE PROJECT

Enerplus, a small international engineering consultancy company specialized in delivering clean energy solutions, partnered with PRAN, one of Bangladesh's largest private food processing companies, to introduce renewable energy and energy efficiency measures in the early stages of PRAN's dairy production chain in remote areas of Bangladesh. The project focused on supporting the network of Dairy Hubs and village-level Milk Collection Centres (MCCs) which has allowed PRAN to replace milk powder imports with fresh milk sourced from small farmers in rural areas, and increase its daily production from 70,000 to 200,000 litres. As of 2018, this network has brought over 30,000 farmers into the formal dairy market and provided them with a steady source of income.

Dairy Hubs and MCCs use energy to cool milk and to heat water for cleaning. The centres are connected to the central grid, but power cuts necessitate the regular use of back-up diesel generators. These diesel generators produce noise and local pollution as well as considerable greenhouse gas (GHG) emissions, and are costly to run. PRAN's generators - like most units installed in remote areas - regularly face supply problems and when they run out of diesel, the milk in the collection centre goes to waste. In 2013-14, the region of Pabna, where most of PRAN's Dairy Hub network is located, experienced power failure more than eight hours every day on average, mostly during peak hours when the cooling systems were needed. Diesel is not always available at all pump stations of the region and on occasion has to be bought as far as 50 kilometres away.

Almost all economic activities in rural areas in Bangladesh are affected by power cuts, and it has been estimated that they result in a loss of annual national industrial output of USD 1 billion. The Government of Bangladesh recognises the lack of reliable power as a major barrier to GDP growth, and intends to improve the power sector by encouraging the formation of public-private partnerships for the execution of power projects. This project demonstrates how businesses can get involved, and interest from other sectors has been high.

PRAN and Enerplus plan to install clean energy technologies in all 103 currently operational Dairy Hubs and MCCs in PRAN's network, and include it in the design of a further 97 hubs and centres to be built. The pilot project supported by REEEP demonstrated the feasibility of this plan by installing solar photovoltaics installations and solar water heaters at four MCCs. Solar PV now provides 95% of the electricity for these centres, with the remaining 5% coming from the grid. As a result, the GHG emissions from the centres have been reduced to close to zero and PRAN saves an estimated USD 17,000 per year in electricity and diesel costs. The payback time for the installed systems is estimated to be around 8 years. The pilot installations were custom designed to match each collection centre's specific needs. Based on lessons learned, Enerplus has designed a standard solution which integrates the entire MCC and all its equipment into two shipping containers. This solution will be used for the full project, reducing payback time to just under 6 years. Enerplus also trained a PRAN team including two engineers to carry out energy audits of chilling systems and maintain and repair solar PV systems.

Since MCCs can only accept milk when their chillers are running and the highly reliable solar PV installations have cut downtime down to zero, the project has increased income reliability for the dairy farmers producing milk for PRAN. Furthermore, the use of solar PV to power Dairy Hubs and MCCs will allow PRAN to expand its milk collection network to areas that are still unconnected to the central electrical grid. This would provide a reliable income to farmers in the remotest parts of Bangladesh. In addition, since the 15 kW -peak capacity of the Solar PV installation is only required for a short time each day to start the cooling equipment before the morning milk arrives, surplus electricity can be sold to neighbours through a mini-grid-like installation, and play an important role in expanding energy access. PRAN is currently testing one of its systems in a fully off-grid configuration.

Another significant achievement of this project is the planned joint investment by PRAN and Enerplus in a Special Purpose Vehicle (SPV), a subsidiary company which will undertake the roll-out of renewable energy solutions not only to the entire PRAN Dairy Hub and MCC network but also to other dairies in Bangladesh. In addition, the SPV will support PRAN in developing energy efficiency and renewable energy measures for other stages of its production chain, and will offer similar services to other businesses in the industry.

The SPV will formalise the long-term collaboration between the two partners, guaranteeing the continuation of the project beyond the pilot phase. In addition to its immediate climate change mitigation impact, therefore, this project has demonstrated that a collaboration between a small international consultancy and a large local business can lead to significant sustainability gains in the operations of that large business, as well as those of the wider sector. It has also demonstrated a successful mechanism for a small injection of public money to leverage significant private sector buy-in.

USD 2760
Average annual income farmers generate selling milk to PRAN's through the dairy hub network (2016)

USD 1359[1]
Annual GDP per capita (2016)

Above: Inside a milk collection centre.
Credit: Enerplus

[1] Data: Tetrapak and World Bank Data

TECHNOLOGY INSTALLED

Above: Design for a fully containerised milk collection centre, including solar installation, solar water heaters and ice batteries.
Credit: Enerplus

Right: A milk collection centre in Nadosayedpur was equipped with a solar installation and two new 1000L milk tanks.
Credit: Enerplus

Technology assessed during pilot:

- Solar PV installations
  - peak capacity: 15kW Installed next to/on the roofs of MCCs
- Solar water heaters
  - capacity: 150 litres

The one-size fits all containerised solution designed for the full project also includes:

- Ice batteries
  - capacity: 56 KWh of refrigeration
- Potential to serve as solar installation for a mini-grid, providing power to surrounding communities

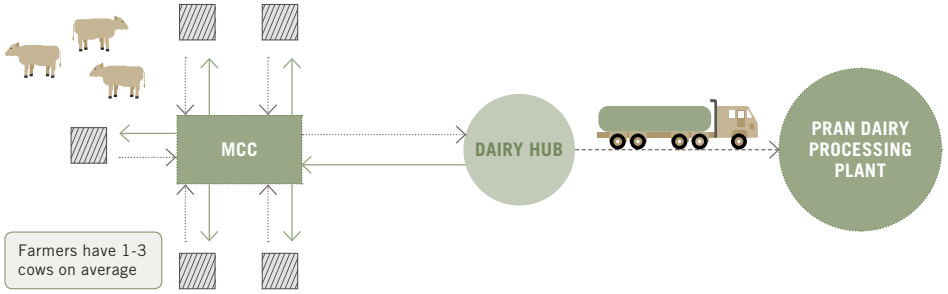
Left: One of the pilot installations in Kumargara. Staff reported that it gets much less hot inside the MCCs now that they are shaded by the solar panels.
Credit: Enerplus

DAIRY HUB CONCEPT

Farmers deliver milk to their nearest MCC

The milk from 20-25 MCCs is collected in a central Dairy Hub

From the Dairy Hub, the milk is transported to a processing plant



Throught the Dairy Hubs and MCCs, PRAN provides the farmers with an income, veterinary services, fodder and access to financing

Scope of full project:

200 centres

$3-5M

520t CO_2 emission reduction

3.7 MW peak capacity

INDICATORS	UNITS	RESULTS
Pilot project		
Number of MCCs	Units	4
Enegry consumed	kWh	33,827
Savings	Euros/year	17,577
OPEX	Euros	4,168
CAPEX	Euros	111,100
Pay-back Period	Years	8.3
CO2 Emmisions Reduction	TCO2/year	22
Full-Scale project (expected)		
Number of MCCs	Units	202
Enegry consumed	kWh	656,892
Savings	Euros/year	887,622
OPEX	Euros	210,494.36
CAPEX	Euros	4,000,000
Pay-back Period	Years	5.91
CO2 Emmisions Reduction	TCO2/year	559

BANGLADESH BACKGROUND STATS

More than **80%** of PRAN's dairy farmers own fewer than 5 milking cattle

Dairy provides a secondary source of income to 95% of farmers in Bangladesh

65% of Bangladeshis, 106 million people, live in rural areas

50% of rural children are chronically undernourished

48.5% of people in rural areas lack access to electricity

36% of the rural population lives on less than USD 2 a day

Where there is grid, power cuts average **6-7** hours a day

WHAT HAVE WE LEARNED?

- ENERPLUS kick-started the cooperation with PRAN by offering free advice on 'low-hanging fruit' energy efficiency interventions in PRAN production facilities - these led to 5% energy savings and convinced PRAN of the feasibility of the Dairy Hub project.
- The project had to find a balance between standardising technology options to utilise economies of scale and customising solutions for each MCC. Though the pilot installed custom installations at each of the 4 MCCs, Enerplus has since developed a standard solution based on the pilot installations that can be deployed in the rest of the network (see page 4).
- Under current regulations, it is difficult for a small company like Enerplus to transfer profits out of Bangladesh. This has caused delays in the founding of the SPV. PRAN and Enerplus have agreed on an interim solution to start the project before the SPV is fully finalised, though a permanent solution is yet to be found.
- Sourcing the technology for the installations was made more difficult by PRAN's strict procurement rules, on the one hand, and foreign technology suppliers' unwillingness to enter into long-term service and maintenance contracts for assets deployed in Bangladesh, on the other hand. As a solution, the technology suppliers provided maintenance training to PRAN staff.
- The delays the project ran into, some due to the volatile political situation in the country, some due to initial hiccups in the cooperation with PRAN and others due to unforeseen regulatory issues, could only be absorbed by Enerplus because of the grant provided by REEEP. However, the learnings generated can help de-risk similar collaborations between international consultancies and large businesses in the future, without the need for grant funding.

Left: An MCC in Goihatta, equipped with a solar installation and a solar water heater.
Credit: Enerplus

REEEP

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Sustainability and Tourism

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CONTACT

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