TECH OFFER

# Unique Tubular Solar Photovoltaic (PV) Technology for Agrivoltaic Farming

## KEY INFORMATION

TECHNOLOGY CATEGORY:
Energy - Solar
Sustainability - Low Carbon Economy

TECHNOLOGY READINESS LEVEL (TRL): TRL9
COUNTRY: SINGAPORE
ID NUMBER: TO174861

## OVERVIEW

In a world where resources are diminishing and demands are rising, the value of land has significantly increased for clean energy and food production. Agrivoltaic farming represents a potential game-changing solution that can bring substantial benefits to both the energy and food sectors.

The patented technology is a tubular solar photovoltaic (PV) module designed for agrivoltaic farming. The unique tubular nature of the system allows sunlight, water, and wind to reach the plants below while simultaneously harnessing solar power. Moreover, the tubular modules can provide consistent partial shading to protect the plants and reduce ambient temperature and ground moisture loss.

This technology enables the dual use of land by integrating agricultural activities such as farming and gardening with solar power generation, maximising the value derived from the limited land. The combination of energy harvesting and agriculture has significant potential to improve farming productivity, increase land-use efficiency, reduce carbon emissions, and promote

environmental sustainability.

The technology owner is keen to collaborate with partners interested in agrivoltaic farming like farmers, gardeners, agritech companies, research centres, and ministries to test-bed and adopt their tubular solar PV technology.

The technology owner is also seeking industrial partners (e.g., manufacturers, system integrators, architects, designers, etc) to co-develop a complete solar energy solution or integrate the tubular solar PV modules into specific use cases.

## TECHNOLOGY FEATURES & SPECIFICATIONS

The technology owner has developed an innovative tubular solar PV module that integrates flexible thin-film solar PV stripes into glass tubes arranged in parallel. The unique design allows for the permeation of sunlight, rain, and wind through the module.

The key features of this technology are:

- Efficient sunlight utilisation: unique design allows it to capture more direct sunlight for electricity conversion
- Sunlight and rainwater permeability: increase productivity and crop yields
- Wind permeability: enable the usage of structures with lower load bearing, reducing the system cost
- Partial cooling shading: reduce moisture loss and protects the plants from excessive solar radiation
- Consistent protection: protect the plants below from heavy rain and hail damage
- Long-term reliability: monolithic PV cells continue work when partially damaged or shaded
- Self-cleaning capability due to cylindrical shape: reduce maintenance cost compared to conventional panels
- Modular design with various sizes: allow customisation for specific requirements and facility scalability
- Horizontal solar PV elevation: enable simple and fast installation (seamless array over large area)

## POTENTIAL APPLICATIONS

The potential applications include but are not limited to:

- Farms (agriculture, aquaculture, viticulture, horticulture, etc.)
- Gardens (open gardens, green roofs, etc.)
- Building façade and rooftop
- Greenhouses
- Natural parks, reservoirs, and lakes
- Other applications (EV charging stations, outdoor canopies, cabanas, pergolas, etc.)

## UNIQUE VALUE PROPOSITION

The patented technology offers the following unique features:

- Maximised land-use efficiency: dual use of the land
- High energy efficiency: constant direct sun exposure
- Optimised plant growth: light, water, and wind permeability
- High reliability and good long-term performance
- Low operating expense (OPEX): negligible maintenance