Solar Energy Hub
Jain Tissue Culture Park, Takarkheda

Jain's Tissue Culture Park, started in 1995 for propagation and supply of 'Tissue Culture Planting Material' for Banana, Pomegranate and Strawberry is the world's largest tissue culture facility spread in close to 90 hectare area near Takarkheda village in Jalgaon district and has annual production capacity of 100 million tissue culture plants. Jain Tissue Culture (TC) Park is a unique example of sustainable farm contributing positively to water and carbon cycles, without generating any auxiliary waste stream. Most of the area in TC Park is under hi-tech green houses, poly houses and shade houses where high quality tissue culture plantlets of banana, pomegranate, and strawberry are produced.

Renewable Energy at TC Park

The energy is consumed mainly for cooling and pumping purposes. A significant amount of energy demand is met by off-grid and on-grid solar installations totalling to 500 kW. Entire water pumping is done from rainwater harvesting and recycled water ponds through floating solar pumping systems. During 2017, solar power met 40% energy demand for tissue culture production. In addition to solar power a substantial carbon of sink has been created over a decade. The green cover in TC Park includes more 30,000 trees. This green cover removes Greenhouse Gas (GHG) emissions equivalent to 2300 tons of CO2 per annum from the atmosphere. Solar Power and green cover together make tissue culture production operations net Carbon Positive.

GHG Emissions per Plantlet (gram CO^2-eq)

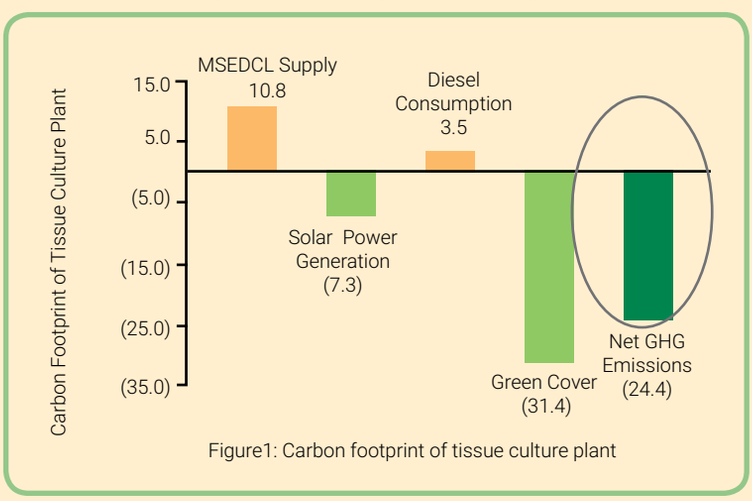
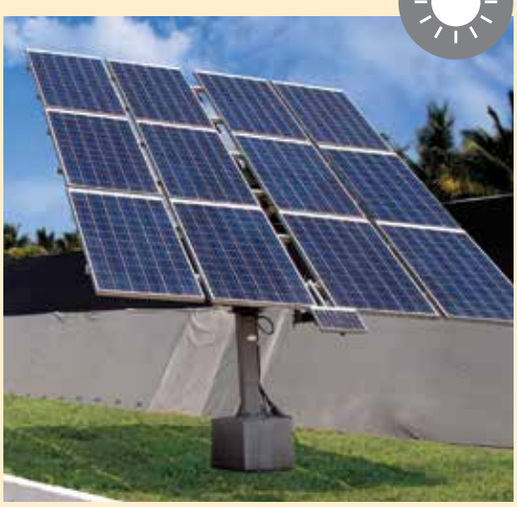


Figure1: Carbon footprint of tissue culture plant



Water Harvesting & Recycling at TC Park

Ground water recharge through rainwater harvesting is the main feature at TC Park. All the groundwater sources (bore well and open well) get recharged by harvested rainwater. Five percent of the total area in TC Park is occupied with constructed percolation ponds. In addition, water is also replenished to aquifers through out of boundary percolation check dam. Water withdrawal for irrigation of TC plants is done through solar water pumps equipped with solar tracking panels.

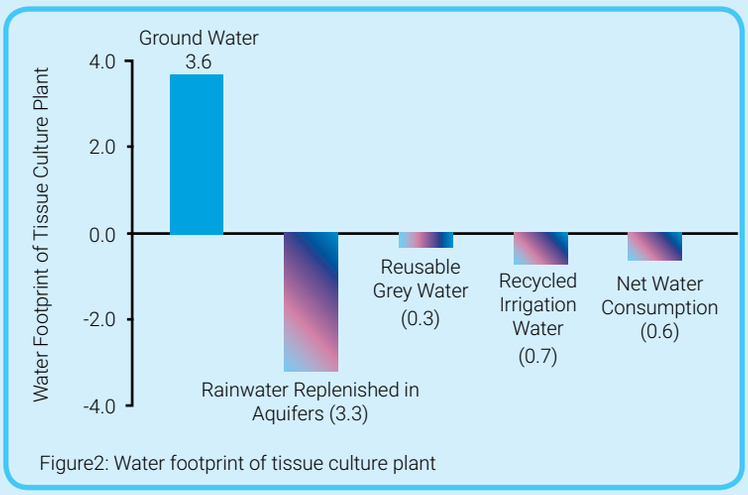


Figure2: Water footprint of tissue culture plant

Through rainwater harvesting in TC Park, 24% more water was replenished into the ground than the consumption in 2017. The water used for irrigation of plants in poly houses is recycled through a channel of pipes and filters. The grey water resulting from washing of cell culture bottles is also separately collected, filtered through filtration unit and finally reused in the irrigation. Thus each plantlet produced in TC Park becomes net water positive.

Solar pump

Tissue Culture park consists of green houses of more than 20 acres and poly houses of more than 75 acres. To fulfil the energy requirement of entire campus including irrigation, fan and pad cooling systems and potable water; pumping requirement is more than 187 kW (250 hp). JISL is running all pumps on solar power without using any electricity. The pump capacity varies between 0.746 kW to 18.5 kW (1 hp to 20 hp). Solar pumps are operated during the day time which, fulfils the water requirement of entire tissue culture park. For all solar pumps solar modules are installed on automatic trackers which provided 25-30% more water as compared to fixed structure.

By using standalone solar pumps, JISL saved 187 kW of additional load demand and its associated electricity bill.

Jain Solar Pumping System

Solar AgroVoltaic Grid connected plants

JISL has installed 14.4 kW AgroVoltaic structure in Tissue Culture Park. It cover 600 sq. m area which is utilised for energy generation as well as banana production. Within the same area, JISL is producing energy as well as food. This is a unique concept demonstrating power generation & farming on the same field. Special design ensures enough sunlight for the crops.

Solar AgroVoltaic Plant

Solar Roof Top Grid connected plants with net metering

Solar Roof Top Grid Connected Plant

JISL has installed 221 kWp roof top grid connected plant in campus under net metering. Grid connected plant is directly synchronised to LT bus of panel eliminating the battery.

By installing roof top solar plant, the heat load of building is reduced. Grid connected plant produces 800-850 units per day.

Solar off grid plant

JISL has installed 100 kWp solar off grid plant to cater the green house loads. Cooling fans of green house are operated using VFD. There are 2 nos of 50 kW inverter with 600 Ah battery bank. Solar off grid plant supply approximately 300-350 units per day.

Solar off Grid Plant

Carbon Footprint of Solar Hub TC Park

Type of Solar System	Energy saving per year, kWh	Co_2 saving, ton
Solar pumps,	273020.0	245.72
Roof top Solar grid connected plant	322660.0	290.40
Solar off grid plant	106762.5	96.09
Total	**702442.5**	**632.21**