

Solar Irrigation Comparison Sheet

Drip vs micro-sprinkler vs pivot vs surface lift, plus component-level options for solar-powered irrigation projects. Supplier-neutral procurement reference by SeedMatchGroup — for projects from USD 250K.

How to read this sheet

For solar-powered irrigation, drip is normally the first choice because it needs the lowest emitter pressure, which means the smallest pump duty point and therefore the smallest PV array per hectare.

Micro-sprinkler suits orchards, nurseries and germination where full-surface wetting or frost protection matters. Centre pivot only makes sense on solar above roughly 50 ha of uniform field. Component choices — submersible versus surface pump, solar controller versus hybrid VFD, day-tank versus lined reservoir, genset versus battery — change installed cost more than panel pricing does.

1. Irrigation method comparison

Method	Pressure	Power / array impact	Best for	Watch out for
Drip / subsurface drip	1.0 – 2.0 bar at the emitter	Lowest kW per hectare — smallest PV array and pump for the same area	Row vegetables, greenhouse and tunnel crops, orchards on lines, water-scarce or high-tariff sites, off-grid schemes	Filtration is mandatory (typically 130 micron or finer plus a sand filter on surface water); emitter clogging and the flushing regime must be specified.
Micro-sprinkler / mini-sprinkler	2.0 – 3.5 bar	Moderate — roughly 1.5–2x the drip array for the same area	Orchards and nurseries, germination and establishment, frost protection, sandy soils needing wider wetting	Higher evaporation and wind drift losses; the array must cover the pressure requirement inside the daylight irrigation window.
Centre pivot / linear move	3.0 – 5.0 bar plus span drive load	Highest — peak power profile usually needs hybrid PV plus genset or battery	Uniform open field above roughly 50 ha, cereals and forage, low-labour operations	Peak demand rarely fits daylight alone; abstraction volume, span drive power and pivot pad civils drive both cost and programme.
Surface / furrow with solar lift	Low head, high volume	Pump duty set by abstraction volume, not by field pressure	Existing gravity schemes, rice and flood-tolerant crops, canal or river lift replacing diesel	Water-use efficiency stays low; the solar case is diesel displacement on the lift, not field-level water saving.

2. Component-level options

Decision	Option A	Option B	How to decide
Pump type	Submersible borehole pump	Surface / centrifugal pump	Submersible for boreholes and deep dynamic head; surface for rivers, canals, dams and reservoirs with suction lift within limits. The duty point at dynamic head — not the nameplate kW — sets the array.
Drive / controller	Dedicated solar pump controller (direct PV drive)	Variable-frequency drive with hybrid input	Direct solar controllers are simpler and cheaper for single-pump daylight schemes. A hybrid VFD is warranted where a genset or grid must share the load, or where pressure has to be held for greenhouse fertigation.
Buffer strategy	Elevated day-tank	Lined reservoir with booster station	Water storage is almost always cheaper than battery storage — it holds energy as head. A day-tank stabilises pressure for one block; a lined reservoir buys 2–5 days of buffer for multi-block schemes and needs earthworks, lining and a booster.

Decision	Option A	Option B	How to decide
Backup energy	Diesel genset backup	Battery storage	Genset backup is normally cheaper per kWh of standby for occasional overcast periods. Batteries are justified where the irrigation window cannot shift into daylight or where continuous pressure is required.
Filtration	Screen or disc filter only	Sand / media filter plus screen, with disinfection	Set by the water analysis, not by budget. Borehole water often needs screen filtration alone; surface water normally needs media filtration plus a disinfection step before drip emitters.
Fertigation	Venturi / simple injector	Dosing head with EC/pH control	Venturi units suit single-block open field. EC/pH controlled dosing is standard for greenhouse and high-value crops, and should be quoted with the pump and filtration as one head assembly.
Telemetry and O&M	Local control only	Remote monitoring with SCADA and spares contract	On remote off-grid sites, telemetry plus a 24-month spares list changes lifetime cost far more than the initial equipment delta. Specify it in the RFQ or it disappears from bids.
Contracting route	Turnkey single package	Separate PV, pump and network packages	Turnkey puts one party behind the duty point being met in the field — usually right for off-grid sites. Separate packages can cost less where the owner carries the interface risk between array, drive, pump and network.

3. Comparison method — the order that keeps bids comparable

- Establish the crop water requirement and peak daily demand in m³/day before comparing any method.
- Convert the method's emitter pressure into a duty point at dynamic head — that number, not the panel price, decides the array.
- Pick the buffer strategy next: days of storage required and whether pressure must be held outside daylight.
- Only then compare drip, micro-sprinkler, pivot or surface lift on installed cost, water efficiency and labour.
- Check the water analysis against the filtration class each method demands.
- Tender all three packages — PV and drive, pump and abstraction, distribution and head — in one RFQ so bids are comparable.

4. Common mistakes

- Comparing irrigation methods on equipment price per hectare while ignoring that each one implies a different pump duty point and PV array size.
- Choosing pivot for a solar site because it looks simplest, then discovering peak power does not fit the daylight window.
- Selecting drip without the water analysis, so filtration and flushing arrive later as a variation order.
- Pricing batteries before pricing water storage, when a lined reservoir usually buys the same reliability for less.
- Comparing a supply-only PV quotation against a turnkey installed quotation as if they were the same scope.
- Leaving reservoir earthworks, lining, trenching and the pump house undefined between owner and supplier.

5. Calculators and next steps

Resource	Link
Crop water requirement calculator	seedmatchgroup.com/crop-water-requirement-calculator
Greenhouse / irrigation planner	seedmatchgroup.com/greenhouse-irrigation-planner
Solar ROI calculator	seedmatchgroup.com/solar-roi-calculator
Fertigation sizing calculator	seedmatchgroup.com/irrigation-fertilizer-sizing-calculator
Pump sizing calculator	seedmatchgroup.com/pump-sizing-calculator
Solar irrigation procurement bands	seedmatchgroup.com/solar-irrigation-procurement
Full comparison page	seedmatchgroup.com/solar-irrigation-comparison
Start a structured RFQ	seedmatchgroup.com/rfq-builder

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