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EDITORIAL ANALYSIS

Power From the Paddy: Why Energy Security Runs Through India's Farms

INDIAN EXPRESS

23 June 2026 · ECONOMY · ENVIRONMENT · GS3

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The Indian Express 23 June 2026 GS3

Source: ujiyari.com — researched, fact-checked & UPSC-mapped

INTERVIEW ANGLE

"Should India treat farmland as a strategic energy asset, or does turning fields into power plants risk the food security it is meant to protect?"

Every fact web-verified against primary sources (https://ujiyari.com/how-we-verify/)

THE ARGUMENT IN ONE LINE

India's road to energy security (https://ujiyari.com/terms/energy-security/) does not end at the port where tankers of imported crude arrive; it runs, the Indian Express contends, straight through the country's farms, where the same hectare can be made to yield both food and electricity.

WHY THIS EDITORIAL MATTERS

India imports close to 85 per cent of the crude oil it consumes, a figure that has been edging higher as domestic output lags. Every spike in global prices or flare-up around chokepoints like the Strait of Hormuz (https://ujiyari.com/terms/strait-of-hormuz/) translates into a heavier import bill, a wider current-account gap and inflation that reaches the kitchen and the fuel pump. Energy security, in other words, is not an abstract diplomatic concern; it is a macroeconomic and household reality.

The obvious response is to generate more power at home from renewables, and here India has set itself an ambitious marker: 500 GW of non-fossil installed capacity by 2030. Solar is meant to do much of this heavy lifting. But solar at utility scale runs into a stubborn physical limit, land. Large solar parks need vast, contiguous (https://ujiyari.com/vocab/contiguous/), relatively flat tracts, and in a densely populated country that land is already growing food or housing people. This is the knot the editorial sets out to cut.

How to Think About It

Frame the problem as a competition for a single scarce resource. The conventional view treats land as a zero-sum choice: a plot is either a field or a power plant. Agriphotovoltaics, or Agri-PV, refuses that binary. By raising solar panels on elevated mounts, it lets crops grow in the filtered light underneath while electricity is captured above. The land stops being a site you must choose a use for and becomes a stacked asset that produces two outputs at once. Once you see land as dual-use rather than single-use, the apparent conflict between food security and energy security dissolves into a design problem.

THE AGRI-PV IDEA, UNPACKED

Agrivoltaics, sometimes written agriphotovoltaics or Agri-PV, is the deliberate (https://ujiyari.com/vocab/deliberate/) co-location of solar photovoltaic generation and agriculture on the same parcel of land. The panels sit on tall structures, leaving enough head-room and spacing for cultivation, grazing or pollinator habitat below. The result is a measurable gain in land-use efficiency: a single hectare delivers a harvest of grain or vegetables and a harvest of kilowatt-hours.

The benefits stack in three directions at once.

- **For the farmer:** a second, weather-independent income stream from selling power, which cushions the blow of a failed monsoon and pushes households toward the long-stated goal of doubling farm incomes. In some configurations the panels also reduce evaporation and heat stress on shade-tolerant crops.
- **For the state:** lower fiscal exposure. A farmer generating and selling solar power needs fewer subsidised electricity units and less subsidised diesel for pumping, easing the chronic burden of agricultural power subsidies on state budgets.
- **For the nation:** a vast, distributed fleet of farm-scale plants that collectively feeds the 500 GW non-fossil target. Because this is decentralised renewable energy generated close to where it is consumed, it also relieves pressure on long-distance transmission and trims line losses.

Where PM-KUSUM Fits

The institutional vehicle already exists. The Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyaan (PM-KUSUM) scheme of the Ministry of New and Renewable Energy was built to solarise Indian agriculture through three components: standalone solar pumps, solarisation of existing grid-connected pumps, and grid-connected solar plants on farmland. Crucially, the second phase of the scheme, PM-KUSUM 2.0, is being designed to include a dedicated 10 GW agrivoltaics component, an explicit policy signal that the dual-use model is moving from pilot plots to national strategy. This is the bridge between the editorial's vision and an executable programme.

THE COUNTER-VIEW, TAKEN SERIOUSLY

A good aspirant does not write a brochure; the model has real frictions that must be weighed.

First, **capital cost.** Elevated mounting structures and the additional steel needed to lift panels high enough for cultivation make Agri-PV dearer per unit of capacity than a conventional ground-mounted array. Without concessional (https://ujiyari.com/terms/concessional/) finance, a smallholder simply cannot front the investment.

Second, **the shading trade-off.** Panels intercept sunlight, which is exactly what light-hungry crops also need. For shade-intolerant cultivars, poorly designed spacing can depress yields, and the promised food-plus-power gain can turn into food-minus-power loss.

Third, **the land-capture risk.** If incentives reward power generation far more richly than cultivation, the rational farmer or, worse, the leasing aggregator may quietly tilt the plot toward electricity and let farming wither, defeating the food-security premise. Weak last-mile credit and opaque tariffs compound the danger for the very smallholders the scheme is meant to lift.

These are not arguments against Agri-PV; they are the specification sheet for doing it well.

WAY FORWARD

The editorial's optimism is warranted only if the programme is engineered for the smallholder rather than the balance sheet of an aggregator. That means crop-specific panel geometry and height so shading is matched to what actually grows below; blended and concessional finance to lower the entry cost for small and marginal farmers; transparent, bankable feed-in tariffs so power income is predictable; and firm land-lease safeguards that prevent fertile land from being captured for generation alone. Extension services must teach farmers to manage a plot that is now both a field and a power station. Done this way, Agri-PV lets India raise food and clean power from the same soil at once.

UPSC RELEVANCE AND PYQ LINKAGE

This editorial sits squarely in **GS Paper 3** (energy security, the economics of subsidies, agriculture and renewable energy) with a thread into **GS Paper 1** (agriculture and land use).

- 2023, GS3: "What are the present challenges before crop diversification? How do emerging technologies provide an opportunity for crop diversification?" Agri-PV is precisely such an emerging technology, recasting land use itself.
- 2018, GS3: "Examine the status of forest resources of India and its resultant impact on climate change." links to the land-and-energy trade-off this model addresses.
- A frequent Prelims hook: schemes for farmers and renewable energy. Remember PM-KUSUM's three components and the new agrivoltaics push, India's roughly 85 per cent crude import dependence, and the 500 GW non-fossil capacity target for 2030.

Facts Corner

- India imports close to 85 per cent of its crude oil, a share that has trended toward 88 to 89 per cent as domestic output lags.
- PM-KUSUM is administered by the Ministry of New and Renewable Energy and has three components: standalone solar pumps, solarisation of grid-connected pumps, and grid-connected solar plants on farmland.
- PM-KUSUM 2.0 is being designed with a dedicated 10 GW agrivoltaics component.
- India’s clean-energy marker: 500 GW of non-fossil installed capacity by 2030.
- Agrivoltaics, the co-location of elevated solar panels and crops, raises land-use efficiency by producing food and power from one plot.

Source: Power From the Paddy: Why Energy Security Runs Through India's Farms — Ujiyari.com | Free UPSC & State PCS Editorial Analysis

KEY ARGUMENTS AT A GLANCE

India's twin vulnerabilities, an 85 per cent dependence on imported crude and a binding land constraint on solar expansion, can be eased together by agrivoltaics, which lets the same hectare generate power and grow food, turning farms into distributed engines of energy security.

✓ SUPPORTING

- Co-locating elevated solar panels with crops sidesteps the land-acquisition bottleneck that slows utility-scale solar, since farming continues beneath and between the rows rather than being displaced by them.
- A second, weather-proof income stream from selling solar power helps move farmers toward doubled incomes and weans state budgets off open-ended power and irrigation subsidies through schemes like PM-KUSUM.
- Decentralised generation on farms feeds the 500 GW non-fossil by 2030 target while strengthening rural grids and reducing transmission losses compared with distant desert mega-parks.

⚠ COUNTER

Critics warn that high upfront capital costs, panel shading that can depress yields of light-hungry crops, weak last-mile credit and the risk of fertile land being captured for power rather than food could leave smallholders worse off if incentives are poorly designed.

→ WAY FORWARD

Operationalise the PM-KUSUM agrivoltaics component with crop-specific panel designs, blended and concessional finance for smallholders, transparent feed-in tariffs, robust land-lease safeguards and extension support, so the model raises both food and power output rather than trading one for the other.

MAINS ANSWER FRAMEWORK

QUESTION

India imports nearly 85 per cent of its crude oil even as it targets 500 GW of non-fossil capacity by 2030, yet utility-scale solar is constrained by the scarcity of land. In this context, examine how agrivoltaics, supported by schemes such as PM-KUSUM, can simultaneously advance energy security, the renewable transition and farmer welfare. What institutional, financial and technical barriers must be addressed for the model to scale? (250 words)

INTRODUCTION

India's energy security and its clean-energy ambition collide with a single scarce resource, land. Agrivoltaics, the co-location of solar generation and cultivation on one plot, reframes this trade-off as a synergy.

BODY

India imports close to 85 per cent of its crude oil, a structural drain on foreign exchange and a strategic exposure to global price and supply shocks. The answer of expanding solar runs into the land constraint, since utility-scale parks need large contiguous tracts that compete with agriculture.

Agrivoltaics resolves this by mounting panels on elevated structures so crops grow underneath while electricity is harvested above. For the farmer, the second income from power sales advances the goal of doubling incomes and offers a cushion against monsoon failure.

For the exchequer, distributed solar under PM-KUSUM, whose second phase adds a 10 GW agrivoltaics component, reduces costly power and diesel subsidies for irrigation. For the nation, millions of farm-scale installations build toward the 500 GW non-fossil by 2030 target through decentralised renewable energy that strengthens rural grids.

The model must, however, manage shading effects on yields, upfront costs and the danger of food land being diverted to power.

CONCLUSION

Designed with crop-appropriate engineering and smallholder-friendly finance, agrivoltaics can let India produce more food and more clean power from the same soil, making the farm a frontline of energy security.

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