Auroville Consulting

Briefing Note

Empowering Marginal Farmers through Pump Solarisation– A Targeted Pathway for Tamil Nadu

November 2025

Auroville Consulting

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Suggested Citation: Empowering Marginal Farmers through Pump Solarisation– A Targeted Pathway for Tamil Nadu

Available at:
https://www.aurovilleconsulting.com/pump-solarisation-farmers-tamil-nadu/

BACKGROUND AND RATIONALE

Tamil Nadu's agriculture–power nexus is large and growing. In 2023, the state had about 2.34 million energised agricultural pump sets and around 2.36 million consumers under the LT–agriculture & government seed farms category, with a connected agricultural load of 13,308.48 MW (TNPDCL, 2024).

Between FY 2015–16 and FY 2023–24, electricity sales for agriculture rose by 62% (ICED, n.d). This demand is supplied as free power to farmers, with the agriculture electricity subsidy outlay expanding 2.4 times, rising from ₹2,996 crore in FY 2014–15 to ₹7,287 crore in FY 2025–26 (TNERC, 2025a) (TNERC, 2025b).

Free electricity cannot last forever. Shifting support to solar can ease the fiscal burden and empower farmers.

At the same time, Tamil Nadu's agriculture sector is dominated by marginal holdings: approximately 85% of operational holdings in Tamil Nadu are marginal (below one hectare in size) and together account for about 39% of the State's total operated agricultural area (GoTN, 2025), with 74% of agricultural households being marginal farmers[1] (SPC, 2022).

Against this backdrop, PM-KUSUM Component C – Individual Pump Solarisation (IPS) provides an opportunity to address Tamil Nadu's growing agricultural energy needs and rising subsidy burden. By solarising existing grid-connected pumps, PM KUSUM-C (IPS) provides reliable daytime power for irrigation and creates an avenue for farmers to earn additional income by exporting surplus energy (MNRE, 2024), strengthening both energy access and rural livelihoods. However, to ensure equitable participation, Tamil Nadu will need to improve beneficiary targeting and use innovative business models to make PM KUSUM-C (IPS) accessible to marginal farmers.

ELECTRICITY USE AND SUBSIDY

Agricultural electricity use in Tamil Nadu has grown by more than 60 % in the past decade. With the entire cost borne by the government, the subsidy burden continues to rise.

Nearly one-fifth of all electricity sold in Tamil Nadu is supplied free to farmers, making agriculture a major driver of both power demand and subsidy expenditure.

Agriculture is the third-largest consumer category in Tamil Nadu's power sector, driven by the provision of free electricity to farmers. Between FY 2015–16 and FY 2023–24, agricultural consumption rose from 10,830 MU to 17,541 MU, representing a 62% increase over nine years (ICED, n.d)). During this period, agriculture's share of total electricity sales increased from 15.96% to 19.52% (ICED, n.d). This means that nearly one-fifth of all electricity sold in Tamil Nadu is provided free to farmers, with full financial burden borne by the Tamil Nadu Government through subsidies.

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[1]*A marginal farmer in this briefing note be understood as a landholder farmer family (husband, wife, and minor children) whose collective operational holding falls within the lowest farm size category, i.e. less than 1 hectare (as per Agricultural Census definitions). For purposes of livelihood classification, such families also qualify as agricultural households when at least one member is self-employed in agriculture and the household earns at least ₹4,000 annually from agricultural activities (as per NSSO definition).*

Table 1 Historical Agricultural Electricity Consumption – Tamil Nadu

Year	Agriculture Consumption (MU)	Share of Total Sales (%)
2015–16	10,830	15.96
2016–17	11,733	17.24
2017–18	11,257	16.26
2018–19	13,078	17.18
2019–20	13,828	17.87
2020–21	13,975	18.98
2021–22	15,401	18.78
2022–23	16,811	19.51
2023–24	17,541	19.52

Source: ICED (Data as of August 2025)

Tamil Nadu's electricity for agriculture is fully funded through direct subsidies from the state government to the distribution company. As a result, any increase in agricultural consumption translates directly into higher subsidy requirements, making this a critical component of the State's fiscal budget.

Over the past decade, the agricultural subsidy burden has more than doubled, rising from ₹2,996 crore in FY 2014–15 to ₹7,287 crore for FY 2025–26. This reflects both:

- Rising agricultural electricity consumption, and
- Increasing per-unit costs borne by the government.

Table 2 Agricultural Subsidy Trend – Tamil Nadu

Financial Year	Total Subsidy (₹ crore)	Agriculture Subsidy (₹ crore)	Growth from 2014-15 (%)
2014–15	5,543	2,996	Base Year
2018–19	7,694	4,098	36.78%
2020–21	8,270	4,291	43.20%
2021- 22	8,876	4,826	61.09%
2022–23	12,008	5,982	99.73%
2023–24	14,917	6,757	125.59%
2025–26	17,052	7,287	143.20%

Source: Auroville Consulting, 2023; TNERC 2015, 2018, 2020, 2021b, 2022, 2023, 2024a, 2024b, 2025a, 2025b, 2025c

As agricultural electricity consumption continues to grow, these subsidies will place pressure on state finances, reducing fiscal space for other development priorities.

INEFFICIENT TARGETING

Marginal farmers make up nearly three-fourths of all agricultural households, earning about ₹10,600 a month on average. Over 60 % are in debt, and benefit the least from free electricity.

Tamil Nadu's agriculture subsidy ensures access for all, but not equity. Marginal farmers—who form nearly three-fourths of all cultivators—gain the least from free electricity, while larger farmers capture a greater share of subsidies.

There are around 2.58 million agricultural households in Tamil Nadu, representing 26.40% of all rural households. Of these, 1.91 million (73.88%) are marginal farmers (SPC, 2022), representing nearly one in five rural households. The average operational holding size across all agricultural households is just 0.831 ha (2.05 acres) (SPC, 2022).

For marginal households as a whole, the average monthly income is ₹10,600–10,700 (SPC, 2022). When imputed costs (e.g., unpaid family labour, owned inputs) are considered, net disposable income declines by roughly 12% (SPC, 2022), leaving a tiny surplus for investment. Indebtedness compounds this challenge, as more than 60% of marginal households carry outstanding loans, with average debt levels ranging from ₹39,000 to ₹71,000 (SPC, 2022). Most borrowing is directly tied to farm operations- 44.7% for capital investments such as pumps and bore wells, and 45.4% for recurring expenses like seeds and fertilisers.

Table 3 Distribution of Indebted Agricultural Households and Average Outstanding Loan by Landholding Size – Tamil Nadu

Landholding Size	% of Indebted House-holds	Average Outstanding Loan (₹)
<0.01 ha	71.1%	39,415
0.01–0.40 ha	62.0%	70,158
0.41–1.00 ha	62.9%	71,018

Source: SPC, 2022

Free power for agriculture has ensured universal access to electricity for irrigation, benefitting all farmers. While this approach has expanded irrigation access and supporting agricultural production, it also means that benefits are distributed across all farmers, irrespective of their landholding size or economic status. As a result, larger farmers with multiple or higher-capacity pumps consume more electricity and, therefore, receive a greater subsidy, while marginal farmers benefit far less.

ROLE OF PM KUSUM-C (IPS)

The imbalance underscores the importance of targeted intervention under PM-KUSUM-C (IPS). Under the KUSUM-C (IPS) scheme, the emphasis is on supporting farmers by solarising agricultural pumps and livelihood enhancement by selling surplus solar.

Tamil Nadu has around 2.34 million energised agricultural pumps serving approximately 2.36 million registered LT agricultural consumers (TNPDCL, 2024). Groundwater pumping is the dominant source of irrigation, accounting for 68% of irrigated area, compared to 28% for canals (SPC, 2022). Solarising grid-connected pumps under KUSUM-C (IPS) directly aligns with this irrigation pattern. This creates an opportunity to prioritise marginal farmers during implementation. Tamil Nadu has currently been sanctioned 5,000 IPS pumps under the scheme (PM-KUSUM National Portal, n.d), a limited allocation of 0.21% of the total pumps. If these initial installations are directed towards marginal farmers, the programme can deliver a higher welfare impact per installation, reducing barriers to reliable power and providing income-generating opportunities.

This prioritising of marginal farmers in scheme rollout can be achieved through targeted beneficiary selection and innovative business models which reduce barriers and address the implementation gaps. In doing so, Tamil Nadu can ensure that IPS address inequities due to land ownership.

Current Gaps In Implementation

Despite the scheme being operational at the national level for over four years and Tamil Nadu receiving sanction for solarising existing pumps under PM-KUSUM-C (IPS), no installations have been completed as of September 2025 (PM-KUSUM National Portal, n.d). This lack of progress indicates multiple gaps in the implementation. From the perspective of marginal farmers, two gaps are particularly critical:

High upfront cost burden for marginal farmers: Under the standard 30:30:40 cost-sharing model, the farmer must contribute 40% of the capital cost, partly through institutional credit. For marginal farmers, this 40% share itself remains a challenge, even when both Central and State contributions are provided. As a result, most marginal farmers are unable to participate

No mechanisms for prioritising marginal farmers: Beneficiary selection currently follows a first-come, first-served approach, favouring farmers with financial and administrative capacity. Without targeting criteria, marginal farmers risk being excluded.

BUSINESS MODELS FOR PM KUSUM-C (IPS)

In the state, 73.88% of agricultural households are marginal farmers, making up nearly one in five rural households. KUSUM-C (IPS) scheme could potentially offer these farmers a moderate, diversified, and steady income source, strengthening financial stability. The business model aims to benefit marginal farmers, the Tamil Nadu Government, and DISCOMs, establishing a win-win-win scenario for all key stakeholders.

Figure 1 Business Models for PM KUSUM-C (IPS)

Market-Driven	**BOT (Build-Operate-Transfer)**	**Full Subsidy**	**P2G (Peer-to-Government)**	**Super RESCO**	**Zero Interest Finance**
Consumers finance rooftop solar (with MNRE subsidy), use net metering/feed-in to offset bills and sell surplus.	EPC/RESCO installs, owns, and operates the system for a time period (Eg 5 years), recovering costs through a dedicated feed-in tariff, before transferring ownership to the consumer.	Government covers entire installation cost; consumer owns system from day one; savings and surplus accrue to consumer.	Consumers install and sell surplus solar directly to government entities via PPA at fixed tariff, offsetting govt electricity costs.	RESCO fully finances, installs, and operates; sells solar to the utility, while the government pays consumers generation-linked incentives.	Consumer gets a interest free loan to finance rooftop solar (with MNRE subsidy), use net metering/ net feed-in to offset bills and sell surplus
Net metering	**Net metering**	**Net metering**	**Net metering**	**Gross metering**	**Net metering**

Note: A monthly settlement period for surplus solar energy under net metering at specified solar tariffs has been assumed.

Market-Driven: In the market-driven model (the current business-as-usual model), beneficiaries purchase and own the solar system, availing the subsidy under the PM KUSUM-C (IPS). The responsibility for financing the residual cost, securing a loan, rests with the farmer. The loan is repaid through bill savings and by exporting surplus solar to the grid at the net feed-in tariff. There are no special payment security mechanisms beyond conventional loan agreements.

Full Subsidy Model: The full subsidy model completely removes upfront cost exposure by covering 100% of system costs through a combination of central (MNRE) and state government subsidies targeting marginal farmers. The state government installs and owns the system initially, later transferring ownership to consumers post-commissioning. Operation and maintenance (O&M) can be managed directly by the government or contracted to qualified vendors. Marginal farmers benefit from self-consumption and receive the standard feed-in tariff for surplus exports. The state recovers costs gradually by reducing future recurring subsidy outlays as consumers shift from grid dependency to solar self-generation. This model can ensure rapid adoption among the most economically disadvantaged groups but requires careful fiscal planning to remain sustainable.

Build–Operate–Transfer (BOT) Model: The BOT model addresses upfront affordability. A public entity such as Tamil Nadu Green Energy Corporation Ltd. (TNGECL) or an EPC firm installs, owns, operates, and maintains RTS systems during the loan tenure, and consumers pay nothing upfront. Post-subsidy capital costs are financed through loans, with repayment ensured by revenues earned from selling surplus energy at a dedicated feed-in tariff that allows the transfer of ownership after 5 years.. After the loan is repaid (e.g., 5 years), ownership is transferred to the marginal farmer who then

benefits from self-consumption and a standard net feed-in tariff. The State Government covers the incremental subsidy increase in the first 5 years to pay the EPC at a dedicated feed-in tariff on the solar gross generation.

Peer-to-Government (P2G) Model: The P2G model introduces direct energy trading between citizens and the government. Marginal farmers self-consume daytime solar generation. Surplus generation is sold to a designated government entity (e.g., schools, hospitals, or street-lighting accounts) at a premium tariff. An escrow system channels all payments first toward repaying any government-backed loan, with excess credited to the marginal farmer. Provides a stable, higher return than standard feed-in tariffs. Reduces payment risk through the escrow mechanism. Strengthens public infrastructure by supplying low-cost renewable power. A minimum five-year O&M contract is bundled into the initial installation cost, ensuring performance reliability.

Super RESCO Model: Under the Super RESCO model, a third-party developer fully owns and operates the solar assets, while marginal farmers lease their land. The gross generation is sold to the DISCOM. Existing electricity subsidies remain unchanged. Marginal farmers receive a lease payment plus a solar incentive, calculated using a virtual net export mechanism that rewards reduced grid draw during solar hours. This model incentivises behavioural change without requiring households to assume financial or operational responsibility. And reduce cross-subsidy burdens on the state by lowering peak domestic and agricultural demand.

Zero Interest Finance Model: Beneficiaries get the MNRE capital subsidy for purchasing solar system, and the remaining cost is covered by a zero-interest loan from the Tamil Nadu government, which is taken by the farmer. Interest is paid by the government, and there are no special payment security measures beyond normal loan terms. The principal repayment of the loan is made by farmers from bill savings and from the sale of surplus solar energy to TNPDCL.

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Financial Analysis of Business Models:

Different business models for PM-KUSUM-C (IPS) over a 25-year years highlight their impacts on farmers, the state government, and Tamil Nadu's distribution company (Auroville Consulting, 2025). These impacts are measured in terms of cumulative financial gains or losses (₹ lakh) per pump with a solar system size of 11 kW over the period of 25 years.

Table 4 Kusum-C IPS for smallholder farmers, 25-year cost-benefit analysis

Models	Consumer	Slab Share of Total (%)	Estimated Tariff Subsidy (INR Crore)
Model 1 - Market Driven	(4.99)	8.54	5.87
Model 2- Full Subsidy	(0.32)	7.71	4.73
Model 3- BOT	(0.81)	3.43	7.27
Model 4- P2G	(3.60)	10.79	7.27
Model 5- Super RESCO	1.17	(1.24)	4.35
Model 6- Zero-Interest Finance	(3.28)	7.71	9.46

Source: Auroville Consulting, 2025
Note: These findings are based on a separate cost–benefit analysis conducted for Tamil Nadu's marginal farmers. Detailed assumptions and calculations are available in the source study.

Key Insights:

- Under the market-driven (current BAU) model, farmers face a loss of ₹4.99 lakh over 25 years, while the state and TNPDCL gain modestly.
- The Full Subsidy and BOT models reduce farmer losses, with relatively balanced fiscal benefits to both the state and TNPDCL.
- The Peer-to-Government (P2G) model maximises state subsidy savings (₹10.79 lakh gain) and utility benefits, but imposes a steep loss on farmers (₹3.60 lakh).
- Only the Super RESCO model delivers net positive returns to farmers (₹1.17 lakh), though it requires the state to absorb a small fiscal loss.
- The zero-interest model, similar to market market-driven model, is also not financially viable for farmers (loss of ₹3.28 lakh), but gives substantial savings for the government and TNPDCL

These findings reveal a trade-off in value distribution. Most models generate state and utility benefits, but farmers remain net losers, undermining the equity objectives of PM-KUSUM-C (IPS). The Super RESCO model offers the only pathway for direct farmer gains but comes at a fiscal cost to the state. Other business models can be made more attractive to the farmer by a combination of increasing permissible solar capacity and thereby the surplus solar that can be exported and sold by the farmer, and by increasing the settlement rate or the solar net feed-in tariff.

CONCLUSIONS

Tamil Nadu's free power policy has expanded irrigation access but created deep fiscal stress and inequities, with larger farmers capturing a disproportionate share of subsidies. PM-KUSUM-C (IPS) offers an opportunity to address both subsidy rationalisation and energy access, while improving rural livelihoods. To realise this potential, marginal farmers must be prioritised through targeted beneficiary selection and innovative business models that reduce their upfront cost burden. Without such focus, the scheme risks reproducing existing inequalities, where benefits flow primarily to better-off farmers.

By aligning fiscal strategy with equity goals, Tamil Nadu can position IPS as a reform, delivering reliable daytime power, lowering long-term subsidy liabilities, and creating a scalable model for farmer-centric agricultural solarisation.

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