



INSTITUT DE HAUTES  
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# **Tackling Water Scarcity in India Through Innovative Finance**

## **Financing Solar-Powered Drip Irrigation Through**

## **Intergenerational Self-Help Community Groups**

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## Executive summary

Due to climate change, India, the largest democratic society and one of the biggest agricultural producers worldwide, is severely affected by heat and drought. “More crop per drop” via the financing of technological upgrades for irrigation has tremendous spillover effects beyond agriculture and significantly contributes to sustainable development and human well-being. In India, the agricultural sector employs around half of the workforce.<sup>1</sup> The country became self-sufficient in grain production, further diminishing water resources,<sup>2</sup> while undernourishment and poverty remain high. Drip irrigation and financing solutions exist on a large scale, but inequalities have been exacerbated by a lack of technological upgrades for small farmers, unsustainable philanthropy, and debt-driven projects. “The problem is not lack of adequate water, but its reckless overuse. China, with a larger population, uses 28% less fresh water than India”.<sup>3</sup>

## Foundation-laid, equity-based investment model for efficient water usage

We propose to provide Indian farmers with sustainable and efficient drip irrigation system using an innovative financing scheme. Most Indian farmers are small and medium enterprises, while only larger businesses can afford drip irrigation programs.<sup>4</sup> This leads to comparative advantages, which exacerbate inequalities. The average Indian farm income is Rs 270 a day and Rs 8,337 monthly net, and therefore not much higher than the minimum wage.<sup>5</sup> Although the financial benefit from solar drip irrigation is undisputed, installation financing is a big hurdle. Installation costs can amount to more than \$3,000 (approximately 230 000 rupees) per acre.<sup>6</sup> At least 25-30 acres of land must be covered by the drip irrigation system to be effective over the long run and use its economies of scale.<sup>7</sup> Assuming a 30% increase in income,<sup>8</sup> the farmer’s community would be able to repay the bank credit over four years with a yearly interest rate of 3.6% (see State Bank of India) and buyout the pension fund equity investment after eight years (see Annex 2: Investment Projection). However, interest payments are not covered by the increased productivity in this calculation. As a result, the internal rate of return for the farmer’s community remains negative (-1%) after eight years for both models (25 acres and 50 acres) although the loan is fully repaid. Only after 9 years, the investment pays off,

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<sup>1</sup> World Bank Data. 2021. *Employment in Agriculture (% of total employment) (modelled ILO estimate) - India*. The World Bank. [Link](#).

<sup>2</sup> Food and Agriculture Organisation of the United Nations. 2022. *India at a glance*. FAO in India. [Link](#).

<sup>3</sup> Economist. 2016. *Why India has a water Crisis*. [Link](#).

<sup>4</sup> Ibid.

<sup>5</sup> Narayanamoorthy, A. 2021. *Why farm income in India is so low*. The Hindu Business Line. [Link](#).

<sup>6</sup> Chu, Jennifer. 2017. *Watering the World*. Massachusetts Institute of Technology. [Link](#).

<sup>7</sup> Syngenta Foundation. 2022. *Developing Irrigation Infrastructure on the Build, Operate and Transfer (BOT) Model*, Syngenta Foundation for Sustainable Agriculture. [Link](#).

<sup>8</sup> Laudes Foundation. 2018. *Bridging the credit gap: Water sustainability through innovative financing*. Laudes Foundation. [Link](#).

with an IRR of 2%, which ultimately increases to 9% after 15 years, when the drip irrigation system reaches the end of its lifecycle, according to our estimation.

Farmer communities' collective action is crucial to financing sustainable irrigation. Self-help groups, on the one hand, allow for joint, intergenerational financing, hence surmounting the hurdle of significant installation fixed costs. On the other hand, they channel work hours set free through technological upgrades into participant selection, monitoring, assessment, and promotion ("drip-start ambassadors") with the help of a multi-stakeholder advisory platform. Instead of demanding collateral, which has led to exploitation and land-grabbing, disclosure and monitoring are indisputable for investors but also bear the potential to restrict freedoms. Hence, community ownership is crucial and carries the benefit of social pressure counteracting moral hazard to ensure compliance. Additionally, creditors avoid adverse selection and extend credits with a higher collective default risk and premium by lending to groups instead of individuals.<sup>9</sup>

We propose funding this project by bridging the gap from impact to return in the field of blended finance for solar drip irrigation. In contrast to comparable projects with 70% in grants, a unique mix of initial grants and a pay-back equity scheme combined with loans could provide a more sustainable, fairer, and community-owned solution that relies on only 20% donations. The first tranche of capital (20%) would come from foundations or government development agencies and transfer these ownership rights to the farmer's community. Additional 40% are financed by pension funds or family offices via a special purpose vehicle with lower-returns expectations through their impact portfolios. This 40% represents an equity investment; without profit participation by the pension funds or family offices, a collective self-help group can pay that out over the long term. After repayment from the farmer's group, the starting capital is reinvested into new projects to scale up over time as a form of sustainable bottom-up funding. Given its advantages, the community-based financing group collectively borrows the remaining 40% of the financing costs at low prices from banks.

#### A shift from pure donations to equity - exploring opportunities

Classical microfinance structures have been applied intensively over the last couple of decades, but their impact is questionable and yet to be proven.<sup>10</sup> Additionally, blended finance approaches with a focus on debt have been exhausted. A combination of official development assistance in the form of *equity* with pension funds and foundations, however, could significantly leverage substantial amounts

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<sup>9</sup> Cole, Shawn. et al. 2011. *Improving Financial Access for Entrepreneurs in Developing Countries - Evidence from a Serial Experiment with Commercial Bank Loan Officers*. IGC Policy Brief. [Link](#).

<sup>10</sup> Banerjee, Abhijit, et al. 2015. *Six Randomized Evaluations of Microcredit: Introduction and Further Steps*. American Economic Journal: Applied Economics, 7(1): 1–21.

of capital from public and private investors from the Global North to the Global South. The main advantage of this project is moving the idea of community-owned solar drip irrigation away from philanthropy and donations to a return-generating model, bridging the so-called valley of death, that is, however, still depending on classical up-front financing in terms of grants.<sup>11</sup> Existing subsidies by the government do not suffice for small and medium agricultural businesses, and existing loan schemes bear the threat of leading to debt and expropriation spirals. Further integrated ways to break this vicious cycle include self-set measures of success and deadlines or legal assistance for the community project.

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<sup>11</sup> Murphy, L. M., and P. L. Edwards. 2003. *Bridging the Valley of Death: Transitioning from Public to Private Sector Financing*. National Renewable Energy Laboratory, NREL/MP-720-34036.