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**Original article****Biogas On The Farm: What Makes Dairy Farmers Say Yes Or No?****Vinuthraj Mj, Gunjan Bhandari\*, Udit Chaudhary and Biswajit Sen***ICAR – National Dairy Research Institute, Karnal – 132001, Haryana**\*Corresponding author: [gunjanbhandari5@gmail.com](mailto:gunjanbhandari5@gmail.com)**Received: 02/07/2025**Published: 06/08/2025***ABSTRACT**

Livestock waste is a mounting challenge across the globe. In India—home to the largest cattle population—this waste not only creates sanitation nuisances but also contributes nearly 7 percent of agriculture’s greenhouse-gas emissions. One promising solution is the use of small-scale biogas digesters that convert dung into clean cooking fuel and nutrient-rich slurry. However, despite multiple government programs, domestic biogas plants are not very popular in India. Even subsidized installations often become non-functional after a few years. This article explores why some dairy farmers adopt biogas technology while others do not, drawing insights from 150 farm households in southern Karnataka. It identifies key enablers—like peer influence, extension support and fuel savings—as well as persistent challenges, such as winter gas dips, red tape and lack of technical help. To realize biogas’s promise, policymakers and outreach workers must streamline subsidy delivery, improve cold-weather operation and leverage peer-to-peer advocacy to inspire more families to say “yes.”

**Keywords:** Adoption, Biogas, Dairy Farmers, Livestock Waste**INTRODUCTION**

Livestock waste management is one of the biggest challenges in many parts of the world. Population growth has been rapid in the modern world which has resulted in increasing demand for livestock products like milk, egg, meat and hides. In order to fulfil these needs, more livestock is being reared which also generates large amount of animal waste. The situation is only becoming worse due to continuous increase in livestock population and land constraints. India has the world's largest livestock population, including cattle, buffalo, goats and poultry. The sheer volume of waste generated from these animals creates immense pressure on waste management systems. An average-sized bovine animal weighs 400 kg and excretes 12–14 liters of urine and 15–20 kg of dung daily (CPCB 2021), most of which is spread on fields or composted for fertilizer. Biogas plants offer an alternative by converting animal waste into energy rich biogas for cooking and slurry for agriculture.

Greenhouse gas (GHG) emissions due to lack of proper manure management in the country account for 7 per cent of total GHG emissions from the agriculture sector (MoEFCC 2018). By managing manure better through biogas facilities, India may cut its annual GHG emissions by 9.3 Mt CO<sub>2</sub> equivalent (Sapkota et al. 2019). Realizing the potential of biogas plants, the Government of India has launched multiple programs viz., GOBAR (Galvanizing Organic Bio-Agro Resources)-DHAN Yojana under Swachh Bharat Mission Grameen-Phase II, New National Biogas and Organic Manure Programme (NNBOMP), Sustainable Alternative Towards Affordable Transportation (SATAT), National Biogas and Manure Management Programme (NBMMP) and Biogas Power Generation (off-grid) and Thermal energy application Programme (BPGTP) for supporting the installation of biogas plants. Union Finance Minister also announced 500 new 'waste to wealth' plants for promoting a circular economy with a total outlay of 10,000 crore under the GOBAR-Dhan scheme (Union Budget 2023). Despite multiple government programs, the adoption of biogas plants among farm households in India remains limited. Even after installation of biogas plants on subsidized basis they are not operated efficiently and a number of biogas plants turn non-functional in a few years. This article, based on interviews with 150 dairy farmers across Mandya, Shivamogga and Davanagere in Southern Karnataka sheds light on why some farmers eagerly embrace this technology while others stay on the sidelines. It also explores what it will take to make biogas a mainstream solution.

### What Drives Adoption?

Farmers' decisions to install domestic biogas digesters are driven by a mix of practical, social and economic factors. While basic infrastructure like space and livestock numbers are prerequisites, what truly drives adoption is human connection. Regular visits from extension officers or NGOs who help with installation, troubleshooting, and paperwork build confidence. Equally important is peer influence: when one farmer sees a neighbor's stove running smoke-free on dung gas, it sparks interest and trust. Interestingly, wealthier and more formally educated households are sometimes less inclined to switch to biogas, perhaps because they already rely on LPG and view biogas as cumbersome. Beyond these social drivers, rising costs of conventional fuels like LPG and firewood make biogas an increasingly attractive and affordable alternative. While factors such as cow-dung management challenges, sanitation improvements and fuel access play supporting roles, it is the combination of personal recommendation, hands-on support and economic benefit that most powerfully motivates farmers to embrace biogas technology.

### How Biogas Transforms Farm Life

Once operational, biogas systems deliver tangible benefits:

Top Benefits	Why it Matters
Cuts spending on LPG and firewood	Farmers save up to 75% percent on cooking fuel costs
Simple and user-friendly	Elderly family members can operate the plant
Replaces chemical fertilizers	Nutrient-rich slurry boosts soil health

Eases daily chores	Less time spent collecting wood and cleaning soot-blackened pots
Improves household hygiene and health	Reduced indoor smoke and fewer respiratory issues

By slashing spending on LPG and firewood—often by as much as 70 percent—farmers enjoy massive savings on cooking fuel, and the nutrient-rich slurry they recover replaces costly chemical fertilisers, returning organic matter to their fields. The system is straightforward enough that even elderly family members can operate it without difficulty, while day-to-day chores become lighter: there’s no more long wood-gathering treks or scrubbing soot-blackened pots. With cleaner combustion, homes stay healthier and more hygienic, cutting the prevalence of smoke-related ailments among women and children. Practical considerations do still matter: a 2-cubic-metre digester needs roughly 50–60 square metres of space—no issue for larger holdings but a challenge for small farms—and delays in subsidy payments can create financial pressure. Yet, most adopters find the system pays for itself quickly through fuel and fertilizer savings.. While few adopters cite improved soil fertility and crop yields as primary advantages, the cumulative benefits of reduced fuel costs, user-friendly operation and healthier living conditions make biogas a compelling choice.

**When Winter Chills the Gas Flow**

Even the most dedicated biogas adopters in Karnataka find that winter brings its own set of challenges. As temperatures dip during the cooler months, the microbes responsible for breaking down organic matter in the digester slow their activity, causing gas output to plunge by as much as one-third. To combat this seasonal slowdown, farmers have devised simple yet effective insulation techniques—wrapping the slurry chamber in thick layers of straw or building improvised mud-brick “jackets” around the digester—but these stopgap measures only partially restore the steady flow of gas.

Beyond the winter slump, adopters frequently contend with irregular supply caused by clogged inlet or outlet pipes, burner blockages and even minor pipeline leaks. When any of these issues arise, cooking plans can be disrupted and homes that count on biogas for daily meals may find themselves scrambling for backup fuel. Regrettably, in many rural areas the absence of a nearby technician means that simple repairs—tightening a loose joint, replacing a gasket, clearing a blocked line—can take days rather than hours. Without prompt service, small problems escalate further undermining confidence in the system’s reliability.

Based on survey of biogas users we ranked these operational constraints in order of impact: winter slowdown in gas production topped the list, followed by inconsistent or low supply and finally the lack of local technical support for minor fixes. While adopters overwhelmingly appreciate the environmental, economic and health benefits of domestic biogas, these seasonal and maintenance hurdles underscore the importance of ongoing hands-on care and better access to rural service networks. Addressing these gaps—through improved digester design, more robust insulation and

mobile technician programs—will be key to ensuring that biogas remains a dependable energy source, even when the temperature falls.

Main Operational Hurdles	Farmers' Rank
Winter slowdown in gas production	1
Irregular or low supply	2
Few technicians for minor fixes	3

### Why Some Farms Still Shun Biogas?

Many farms still hesitate to adopt biogas despite its clear environmental and economic advantages and three main barriers stand in their way. First, awareness of government subsidy schemes remains low. Most farmers simply don't know such programs exist or how to apply. Second, those who do try to secure support often encounter slow approvals and excessive paperwork. The red tape can stretch over months, during which farmers must cover upfront costs themselves—an impossible burden for many smallholders. Third, even after subsidies, the initial investment feels too steep, especially when loans carry high interest rates or require collateral.

Majority of the non-adopter said that they would install a biogas plant if the subsidy process were quicker and simpler. The rest cited limited space for the digester, insufficient livestock dung to feed the system or complete unawareness of available schemes. Beyond the top three constraints, other challenges include difficulty obtaining loans, lack of technical support and low levels of government funding per installation. Similar studies, such as Roubik et al. (2018), highlighted lack of cash at hand, not being selected for subsidies and limited space as major roadblocks. Addressing these information gaps and streamlining subsidy disbursement could tip the balance for many non-adopter households. Simple interventions—like dedicated help desks at village fairs or interest-free micro-loans—could transform biogas from a distant idea into an everyday reality for thousands of rural families.

### Bridging the Gap: Making Biogas Work for Everyone

To turn biogas from a niche innovation into a mainstream energy solution, dairy farmers need more than subsidies and equipment—they need hands-on support, smarter designs and practical technical boosts. Field demonstrations that run digesters through every season can show skeptics how systems perform when mornings are chilly and workloads heavy. Paired with training programs for basic maintenance and efforts to cultivate local service providers, these live tutorials would ensure farmers don't face weeks of downtime when pipes clog or burners falter. At the same time, introducing compact standardized plant models designed for smaller homesteads would make installations feasible even in cramped yards and simplify repairs when something goes wrong. To address the winter slowdown in gas production, distributing starter culture kits of methanogenic bacteria can jump-start digestion at lower temperatures so that even early morning stoves begin with a solid flame.

Policymakers can streamline subsidy disbursement by tying payments to construction milestones instead of issuing one final lump sum, reducing financial risk on smallholders and encouraging timely completion. Expanding extension networks through more farm visits by agricultural officers and village champions would build grassroots enthusiasm and convert early interest into lasting adoption. Training village-level technicians will guarantee that minor breakdowns become same-day fixes rather than week-long headaches, keeping plants humming throughout the year. With these measures in place, biogas systems not only become more reliable but also transform into genuine engines of sustainable agriculture: a renewable waste stream yields clean low-cost cooking fuel while the nutrient-rich slurry replenishes soils without chemical inputs.

As climate change raises energy costs and governments seek greener rural solutions, small-scale biogas stands out as a win-win opportunity. By tackling barriers of awareness, financing, design and technology, Karnataka can pioneer a model that ripples across India's dairy belt and beyond. When more households light their stoves with farm-fresh gas, the dream of turning waste into wealth will move from aspiration to everyday reality for farm families.

## **CONCLUSIONS**

Biogas holds enormous promise for India's dairy farmers but turning that promise into reality requires more than just planting digesters in farmyards. As we've seen, farmers say "yes" when they understand how subsidies work, witness reliable performance through field demos and receive hands-on support from extension agents and local technicians. They cling to biogas when they reap real savings on LPG and firewood, enjoy simpler cooking and healthy smoke-free homes and feed nutrient-rich slurry back into their fields. Yet without clearer information on subsidy schemes, faster paperwork, compact designs for small plots and starter-culture kits to keep winter production steady, many potential adopters remain on the sidelines. Closing these gaps will take coordinated action: streamlining subsidy disbursement into milestone-based payments to reduce financial risk, expanding on-farm demonstrations to turn curiosity into conviction and training village-level service providers to nip breakdowns in the bud. Compact modular digesters and methanogen starter cultures can ensure year-round performance even in cramped or chilly conditions. With these measures, biogas can become more than a pilot project—it can power kitchens across Karnataka and beyond, cut greenhouse-gas emissions and transform manure from a nuisance into a source of clean fuel and soil fertility. If policymakers, NGOs and farmers work together to simplify, standardize and support domestic biogas systems, the tide will turn. What today feels like a fringe technology can become the backbone of sustainable rural energy, helping thousands of families say "yes" to cleaner, cheaper cooking every day.

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