Fueling future: Suhas Baxi on making Indiaâ??s bioenergy model economically viable

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In an exclusive interview with AgroSpectrum, Suhas Baxi, Co-Founder and Group CEO of BiofuelCircle, unpacks the real economics behind the â??farm to fuel to soilâ• model and its path to self-sustainability. He highlights how scalable bioenergy systems can move beyond subsidy dependence by building efficient biomass supply chains and competitive pricing.

The conversation dives into the rise of rural micro-entrepreneurship, revealing early profitability trends across biomass banks and their growing impact on local economies. Baxi also addresses critical risks, from feedstock volatility to environmental trade-offs, while explaining how digital marketplaces and data-led planning are reshaping the sector. Ultimately, he positions fuel substitution as the single most powerful metric proving that bioenergy can play a meaningful role in Indiaâ??s energy transition.

The â??farm to fuel to soilâ?• model promises a closed loop system where agricultural waste becomes energy and bio residue returns to farmland. Is this economically self sustaining at scale, or does it remain subsidy dependent in most markets?

The farm to fuel to soil approach can achieve economic self-sufficiency when scaled effectively. Incentives and subsidies should ideally act as catalysts to accelerate adoption rather than long-term dependencies. As with most infrastructure-led sectors, bioenergy ventures typically operate on a three-to-five-year payback cycle, where early policy support helps unlock capital and drive momentum. However, reliance on continuous subsidies signals an inherent weakness in the model.

Our focus is on developing supply chains and operational efficiencies that enable bioenergy products to compete with conventional fuels on price. This ensures long-term viability independent of policy support. A key enabler is building dependable biomass aggregation and logistics networks, ensuring consistent feedstock availability at stable and predictable costs for both producers and end users.

You describe the model as a catalyst for rural micro entrepreneurship. How many of these enterprises are truly profitable without grant capital and what does survival data tell us about long term viability?

At BiofuelCircle, each biomass bank is structured as a standalone rural enterprise operating on sound commercial fundamentals. Typically, these units require an investment of around Rs 3 crore and generate annual revenues of approximately Rs 3 to Rs 4 crore. Over the past three years, we have established close to 70 such biomass banks, forming a robust rural enterprise network within the biomass value chain.

The earliest batch of around ten units has already reached profitability, while the next set of about twenty-five is steadily moving in that direction. Current trends indicate that most units turn EBITDA positive within 12 to 18 months and recover capital investment within three to four years. While none have yet completed a full lifecycle, early performance signals are encouraging, pointing to a viable and scalable rural enterprise model. In addition to financial returns, these ventures generate employment and formalise markets for agricultural residues.

From an energy security perspective, can decentralized bioenergy realistically de risk national supply chains, or is its contribution still marginal compared to fossil infrastructure?

Decentralised bioenergy should be seen as a complementary pillar within the broader energy mix, rather than a replacement for fossil fuels. Even with optimal utilisation of biomass resources, it is likely to meet around 10 to 12 percent of national energy demand in the medium term, particularly as overall consumption continues to grow.

That said, its role in strengthening energy security is significant. By reducing dependence on imported fossil fuels and diversifying energy sources, bioenergy contributes to greater resilience. When combined with renewables like solar and wind, it enhances supply stability. In India, this shift is already underway, with initiatives such as ethanol blending and increasing adoption of compressed biogas across mobility and industrial sectors.

Feedstock aggregation is often the weakest link in bio circular systems. How do you prevent supply fragmentation, seasonal volatility and price distortions in agricultural residue markets?

The challenge of fragmentation can be addressed by treating biomass as part of an organised, nationwide market rather than isolated local supply chains. Strong supply systems require visibility into demand and supply, transparent pricing mechanisms, stable market signals and clearly defined quality benchmarks.

At BiofuelCircle, we are building this ecosystem through a digital biomass marketplace that connects farmers, aggregators and industrial buyers on a unified platform. This enables transparent price discovery, structured transactions and data-led supply planning, which together help reduce volatility and improve reliability. Additionally, we leverage GIS and GPS based intelligence to map crop patterns, farmland and residue availability, enabling more efficient planning of aggregation and logistics infrastructure.

Carbon credits and sustainability premiums are often cited as revenue boosters. If carbon markets soften or compliance rules tighten, does the circular model still hold up financially?

Carbon credits and sustainability incentives should be viewed as supplementary gains rather than the core foundation of the business. Overdependence on such mechanisms introduces uncertainty and weakens the economic structure.

Our approach is to ensure that bioenergy products are cost competitive with traditional fuels through efficient supply chains and operations. When this baseline is achieved, the business remains financially sound on its own merit. Carbon credits and similar incentives then serve as an added advantage, rewarding environmental impact, but not determining viability. The primary focus remains on building a resilient and efficient biomass ecosystem that supports large-scale adoption.

What are the hidden risks such as methane leakage, soil nutrient imbalance, or over extraction of biomass that could undermine the environmental case for a closed loop system?

The sustainability of the circular model depends on staying aligned with its core principle, which is utilising agricultural residue and waste rather than cultivating dedicated energy crops. When biomass is sourced from existing waste streams, the environmental benefits remain intact, as it prevents open burning and adds value to otherwise unused material.

However, shifting toward purpose-grown energy crops could alter this balance by diverting land, water and other resources away from food production. Maintaining a clear distinction between waste utilisation and crop cultivation is therefore essential to preserving environmental integrity and ensuring that bioenergy remains a responsible waste-to-energy solution.

Institutionally, who owns the value chain: farmers, cooperatives, private processors, or energy majors? And how does governance determine whether wealth is retained locally or extracted upward?

The bioenergy value chain is inherently collaborative, involving multiple stakeholders rather than being controlled by a single entity. Farmers provide the raw biomass, local enterprises handle aggregation and processing, technology players enable conversion, and industries consume the final energy output.

Ownership structures can differ across segments, ranging from cooperatives to private companies and large industrial players. What matters most is building an ecosystem where value creation and distribution are balanced across participants. Farmers play a foundational role, but the system also depends on investments in infrastructure, logistics and technology. Much like other large industries, such as pharmaceuticals or energy, effective coordination across the supply chain is key to ensuring both efficiency and equitable value distribution.

If you had to choose one metric to prove the model works, income uplift, emission reduction, fuel substitution, or soil health, what would it be?

The most definitive measure of success is the extent to which bioenergy replaces fossil fuels. Large-scale fuel substitution indicates that the system is functioning efficiently and delivering real impact.

As bioenergy displaces conventional fuels, it naturally leads to multiple positive outcomes, including lower emissions, higher farmer incomes through residue monetisation and improved waste management practices. In that sense, fuel substitution serves as the central indicator, with other benefits emerging as natural outcomes of a well-established ecosystem. It also reflects the sectorâ??s contribution to the broader energy transition, supported by developments such as ethanol blending and increased use of compressed biogas across industries and transport.

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