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Ethanol Blending in India: Fuelling Farmers, Fuelling the Future

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India's Ethanol Blended Petrol (EBP) Programme has moved from a marginal, slow-moving idea to one of the country's most successful and fast-tracked energy initiatives. Starting with blending levels of barely 1-2% a decade ago, India achieved the ambitious 20% ethanol blending (E20) target by late 2025, well ahead of its original 2030 deadline, and made E20 mandatory at fuel pumps from April 2026. This transformation has reshaped rural economies by creating a guaranteed market for sugarcane, rice, and maize, while simultaneously cutting India's crude oil import bill and improving air quality in cities. Yet the programme is not without friction: vehicle owners report mileage loss, older engines face compatibility concerns, and questions persist around food security, water use, and the true environmental footprint of large-scale ethanol production. This article presents a balanced, farmer-and-consumer-friendly overview of how ethanol blending works, why it matters for Indian agriculture, what benefits and challenges it brings, and where the programme is headed as India eyes even higher blends such as E30.

Introduction

Every time a farmer in Uttar Pradesh delivers sugarcane to the local mill, or a maize grower in Bihar sells surplus grain at a government-supported price, a small but growing share of that produce no longer ends up only as sugar or animal feed. Increasingly, it is converted into ethanol a clear, flammable alcohol that is blended directly into the petrol millions of Indians use to run their two-wheelers, cars, and tractors every day. This quiet but far-reaching shift is the result of India's Ethanol Blended Petrol (EBP) Programme, first launched in 2003 but only seriously accelerated after the National Policy on Biofuels of 2018 set a bold target: 20% ethanol blending in petrol, nationwide, by 2030.

What makes this story remarkable for agriculture is the speed at which the target has been met. India crossed the 10% blending mark (E10) in June 2022, a full five months ahead of schedule, and went on to achieve the 20% milestone (E20) by late 2025 roughly four years earlier than originally planned. From April 1, 2026, E20 fuel became compulsory at petrol pumps across every state and union territory. The Bureau of Indian Standards has already notified specifications for even higher blends E22, E25, E27, and E30 under a new standard effective from May 2026, with discussions underway on flex-fuel norms for E85 and E100 vehicles that can run on almost pure ethanol.

For the agricultural sector, this is not just an energy story; it is a farm-income story. Sugarcane, rice, and maize growers now have an additional, government-backed buyer for their produce, insulating them somewhat from the price swings that have historically plagued the sugar industry. At the same time, the rapid scale-up has raised genuine questions about

food security, water use, and whether India's vehicle fleet and rural infrastructure can keep pace with the policy's ambition. This article unpacks both sides of that story for the farming and agribusiness community.

What Exactly Is Ethanol Blending?

Ethanol blending simply means mixing ethyl alcohol produced mainly from sugarcane juice, B-heavy and C-heavy molasses, surplus rice, and maize with petrol in a fixed proportion. An “E20” fuel, for instance, contains 20% ethanol and 80% petrol. Because this ethanol is grown and distilled within India, every litre blended into the national fuel pool is a litre of crude oil that does not need to be imported. The programme rests on three pillars that matter directly to farmers and the rural economy: cutting India's dependence on imported crude oil, creating a stable, guaranteed offtake market for sugarcane and grain surpluses, and lowering vehicular emissions compared with pure petrol.

Behind the scenes, the programme is run jointly by the Ministry of Petroleum and Natural Gas, the Ministry of Agriculture, public sector oil marketing companies such as Indian Oil, Bharat Petroleum, and Hindustan Petroleum, and a fast-expanding network of distilleries many of them sugar mills that have added ethanol units alongside their traditional sugar production. The Food Corporation of India also occasionally releases surplus rice stocks for ethanol production when grain supplies are comfortably above buffer-stock requirements.

Why Farmers Stand to Gain

The single biggest agricultural benefit of the EBP Programme has been the creation of a price-supported, assured market for sugarcane byproducts and grain. Sugar mills, which earlier struggled with cyclical gluts that depressed prices and delayed farmer payments, can now divert a portion of their cane juice and molasses toward ethanol instead of sugar, smoothing out their revenue and enabling faster, more reliable payments to growers. Industry estimates suggest that well over ₹1.18 lakh crore (roughly \$14 billion) had reached farmers through ethanol procurement by early 2026, with the benefit concentrated in sugarcane belts such as Uttar Pradesh, Maharashtra, and Karnataka.

Importantly, the feedstock base is no longer limited to sugarcane alone. As maize has been brought into the ethanol supply chain, growers of this crop spread across states like Madhya Pradesh, Bihar, and Karnataka have also gained a new, dependable buyer. This diversification matters for two reasons: it spreads the economic benefit across a wider set of farming communities, and it gradually reduces the programme's reliance on water-intensive sugarcane, addressing one of the most common criticisms levelled at the scheme.

The ripple effects extend beyond the farm gate. New distillery capacity, both grain-based and molasses-based, has triggered fresh investment in rural and semi-urban India, generating direct employment in plant operations and logistics, and indirect employment in feedstock cultivation, transport, and storage. A complementary initiative, the Sustainable Alternative Towards Affordable Transportation (SATAT) scheme, is encouraging compressed biogas production from crop residues and organic waste, further widening the rural bioenergy economy and offering farmers an additional way to monetise agricultural waste rather than burning it.

The National Benefits: Energy Security and Cleaner Air

Beyond the farm, ethanol blending delivers clear macroeconomic benefits. India imports the bulk of its crude oil requirement, and every additional percentage point of blending is estimated to require around 550–560 million litres of ethanol fuel that does not have to be bought from abroad. Over the course of the programme's rapid scale-up, this has translated into substantial foreign exchange savings and a degree of insulation from global oil price shocks triggered by geopolitical conflict or supply disruption.

There is also a public health dimension. Ethanol contains oxygen in its molecular structure, which tends to promote more complete combustion and can lower carbon

monoxide and particulate emissions compared with pure petrol. In a country where several northern cities battle severe winter air pollution, even incremental improvements in vehicular emissions are seen as a meaningful public health gain, and the programme is frequently cited as part of India's broader climate and decarbonisation commitments.

From a governance perspective, the EBP Programme is also notable simply because it worked on schedule and ahead of it. A target originally set for 2030 was achieved by late 2025, a rare example of an ambitious Indian industrial policy goal being met early. This track record has strengthened investor confidence, with industry bodies such as the All-India Distillers' Association now pushing for clear, time-bound roadmaps toward E25 and E30, and automakers responding by investing in flex-fuel and hybrid technologies.

The Other Side: Costs, Concerns, and Trade-Offs

No large-scale agricultural and energy transition comes without trade-offs, and ethanol blending is no exception. The most immediate concern for ordinary consumers is fuel efficiency: ethanol carries roughly two-thirds the energy density of petrol, so vehicles running on E20 typically see a 4–6% drop in mileage compared with pure petrol. For many vehicle owners, this offsets at least part of the cost advantage of cheaper ethanol, and it has become one of the most widely voiced public grievances since the E20 mandate took effect.

A related concern is engine compatibility. Ethanol is more corrosive than petrol to certain rubber, plastic, and metal components, and while new vehicles are now built to be E20-compatible, India's enormous fleet of older two-wheelers and cars originally designed for E5 or E10 fuel faces a real risk of fuel-system wear over time. This transition burden tends to fall hardest on lower-income vehicle owners who are least likely to own the newest models, raising fairness questions about who bears the cost of the shift.

For the agricultural sector specifically, the most sensitive debate concerns food security and water use. Because a significant share of ethanol feedstock still comes from sugarcane juice, rice, and maize, diverting agricultural resources including, at times, surplus rice from the Food Corporation of India's buffer stocks toward fuel rather than food has drawn criticism during periods of food inflation or uncertain monsoons. Even when feedstock genuinely comes from surplus, the land, water, and fertiliser used to grow it represent an opportunity cost. Sugarcane in particular is an extremely water-thirsty crop, much of it grown in already water-stressed states such as Maharashtra and parts of Uttar Pradesh, fuelling concern that the programme could deepen groundwater stress in regions already prone to drought.

There are also questions about the true environmental payoff once the full lifecycle is considered. Growing, harvesting, transporting, and distilling feedstock all consume energy and inputs such as fertiliser and pesticide, and some independent analyses suggest that once these upstream costs are factored in, the net greenhouse-gas benefit of ethanol blending is smaller than the headline numbers imply. None of this negates the programme's value, but it does complicate the simple narrative of ethanol as an unambiguous environmental win.

Finally, scaling the programme nationally has required heavy investment in logistics, since ethanol cannot move through existing petroleum pipelines and must instead be transported by rail and road tankers from production hubs in states like Uttar Pradesh and Maharashtra to fuel-deficit regions elsewhere. Uneven infrastructure readiness has, at times, led to inconsistent fuel availability and quality across different parts of the country, while the administratively set procurement price for ethanol though useful for attracting investment exposes the government and consumers to risk if feedstock costs or global oil prices move sharply.

Striking a Balance: What the Future Holds

The debate over ethanol blending in India is rarely a simple story of good policy versus bad policy. It is, more accurately, a story of trade-offs that look different depending on who is asked. For the national economy, the programme has delivered measurable benefits in foreign exchange savings, energy security, and policy credibility. For sugarcane- and maize-growing

farmers, it has created a more stable and additional income stream. For ordinary vehicle owners, especially those with older two-wheelers, the costs in mileage and component wear are real and unevenly distributed.

As India pushes toward even higher blends E22, E25, E27, and eventually E30, alongside emerging E85 and E100 flex-fuel standards many of these tensions are likely to intensify before they ease. Higher blending percentages will increase demand for feedstock, potentially sharpening the food-versus-fuel and water-stress debates, while also requiring further vehicle engineering changes and infrastructure investment. At the same time, continued diversification of feedstock toward grains like maize, and investment in second-generation (2G) ethanol technology that can use crop residues and non-food biomass instead of foodgrain, could help ease both the food-security and water-intensity concerns over the coming years. For the farming community, this points toward an important opportunity: residues that were once burnt in the field, contributing to air pollution, could increasingly become a valuable input into the ethanol supply chain.

Lessons for Other Crops and Regions

The ethanol experience also offers useful lessons for India's broader agricultural diversification strategy. States that have moved early to build distillery capacity alongside their sugar mills Uttar Pradesh, Maharashtra, and Karnataka in particular have seen the most direct benefit in farmer payments and rural employment, suggesting that timely infrastructure investment, not just feedstock availability, determines how much of the policy's gains actually reach the farm gate. States with strong maize or surplus-grain production but limited distillery capacity have, by contrast, captured a smaller share of the benefit so far, pointing to an opportunity for targeted investment in regions such as Bihar, Madhya Pradesh, and parts of the Northeast. Encouraging cooperative and farmer-producer-organization-led distillery models, rather than leaving capacity concentrated with large private players, could also help ensure that a greater share of the value chain's profits flow back to growers rather than intermediaries.

Conclusion

India's ethanol blending programme has grown from a modest, slow-moving scheme into one of the country's most consequential agricultural and energy policies, reaching its 20% blending target roughly five years ahead of the original 2030 deadline. For farmers, particularly sugarcane and maize growers, it has opened a new and increasingly reliable revenue stream, helped stabilize rural incomes, and spurred fresh investment in rural distillery and bioenergy infrastructure. For the nation, it has meant real savings in foreign exchange, greater energy security, and incremental gains in urban air quality.

At the same time, the programme's critics raise legitimate concerns: mileage loss and compatibility issues for vehicle owners, the water intensity of sugarcane cultivation, the opportunity cost of diverting food-grade grain to fuel, and questions over the true net environmental benefit once full lifecycle emissions are considered. As India now turns its attention to E30 and beyond, the central challenge will be to manage these trade-offs thoughtfully diversifying feedstock away from water-intensive sugarcane toward grains and, eventually, non-food biomass through second-generation ethanol technology; giving vehicle manufacturers adequate time to engineer compatibility; and continuing to invest in distribution infrastructure so that fuel quality remains consistent nationwide. Whether ethanol blending ultimately proves a complete success for Indian agriculture will depend less on the headline blending percentage, and more on how well these underlying trade-offs are managed in the years ahead.

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