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They flew jets on seed oil. Next stop is the kitchen.

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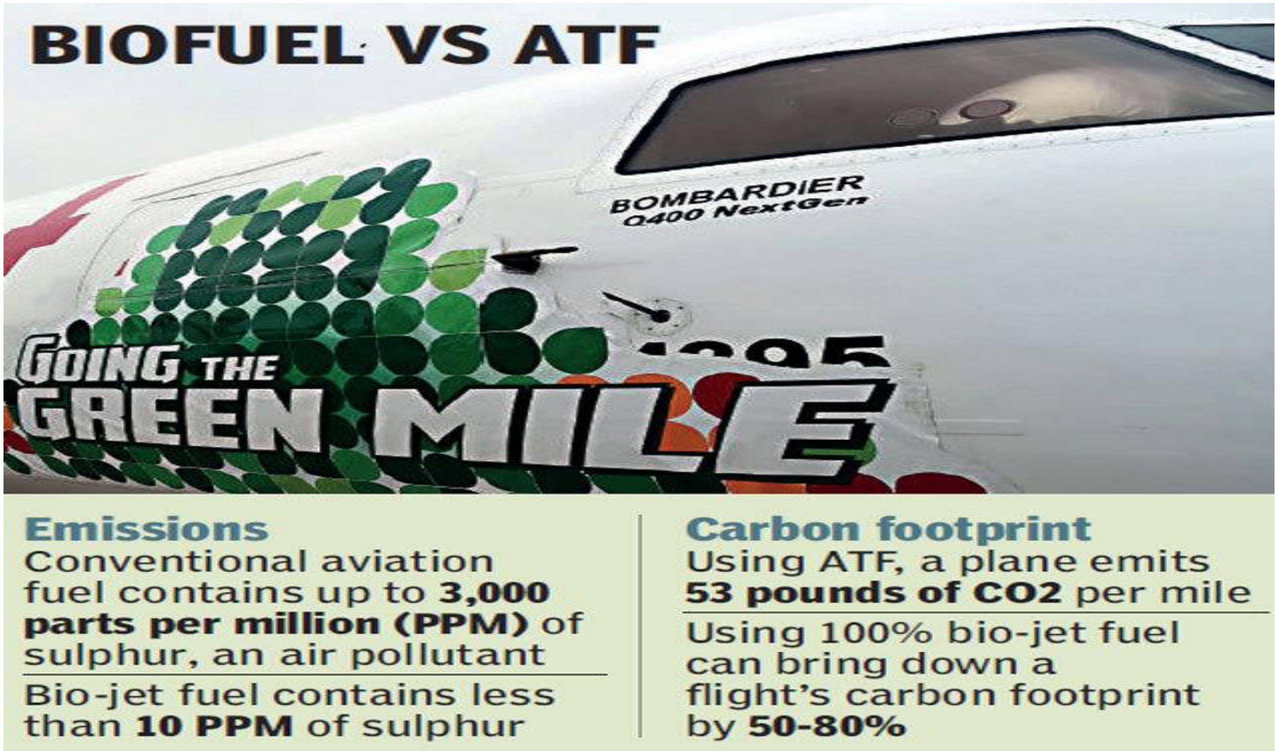
For eight years, a team of 20 scientists worked to convert the small black seeds of the jatropha plant into fuel to fire the engines of a jet plane. On August 27, their work at the verdant campus of Indian Institute of Petroleum (IIP) in Dehradun paid off. Three hundred and thirty kilos of bio-jet fuel developed from jatropha — a hardy plant with nearly 40% oil content — was partially used to propel a 45-minute SpiceJet flight from Dehradun to Delhi+ .

The IIP team took four days to extract this quantity of oil, which was used in the right engine of the plane. "Since this was a test flight, only 25% of bio-jet fuel was used and the rest was conventional aviation turbine fuel (ATF). International standards cap the use of bio-jet fuel at 50% in each engine," says Dr Anjan Ray, director, CSIR-IIP.

Feedstock for bio-jet fuel can be obtained from 400 types of plant seeds. This initiative relied on jatropha as it was readily available from the Chhattisgarh Biofuel Development Authority. "Around 500 farmers from Maoist-hit villages grow this crop. It's transforming their lives," says Ray.

Planes use kerosene-based fuels, which are polluting. According to the Intergovernmental Panel on Climate Change (IPCC) and World Meteorological Organisation (WMO), air transport contributes to 4.9% of climate change. Burning biofuel also leads to emissions but they're less toxic.



"Any hydrocarbon fuel will generate about 3.15 tons of CO_2 per ton of fuel combusted. But when we burn fuel that's been obtained from a plant, its carbon emission is balanced by the carbon the plant absorbs from the atmosphere. Using 100% bio-jet fuel on a flight can bring down its carbon footprint by 50-80% depending on feed stock, supply chain and process of production," explains Ray.

Another benefit is reduced air pollution. "Conventional aviation fuel contains 3,000 parts per million of sulphur that leads to emission of sulphur dioxide. Biojet fuel contains less than 10 parts per million sulphur."

The IIP is also working on ways to turn used cooking oil into biofuel for both jets and automobiles. A litre of used cooking oil can yield 850-950ml of biodiesel. India's Food Safety and Standards Authority (FSSAI) has introduced regulations from July 1 that bar commercial eateries from reusing cooking oil, and instead encourages them to pass it on to biofuel developers. "Annually, about 23 million tonnes of cooking oil is consumed in India," says an FSSAI communication.

"The conventional jet fuel demand in India is 6-7 million tonnes, up to half of that can be technical substituted by bio-jet fuel, and about a third of this half can be obtained from used cooking oil," says Ray. If biofuels have benefits, why are cars and planes still powered by petrol and kerosene? It's the cost and the difficulty of manufacturing it on an industrial scale.

Globally, bio-jet fuel is 60-70% more expensive than conventional fuel. Sceptics say developing biofuels is not a sustainable and long-term solution to climate change. But Dr Ray says that the low cost of feedstock and used cooking oil in India could make bio-jet fuel quite competitive with ATF.

Another argument levelled against biojet fuel is that growing feedstock for it could compromise food production. "Fuel crops should never replace food crops, but be planted in a planned manner on non-competing land to supplement farmer income," says Ray in defence of greener fuel. Despite the criticism, the team at IIP has moved ahead. They are shopping for a suitable commercial partner to scale up production of biofuel.