

## **PRESS RELEASE**

# **IIT Hyderabad Researchers Use Machine Learning Algorithms to study Supply Chain Network of Biofuels**

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**HYDERABAD, 23<sup>rd</sup> March 2020:** Indian Institute of Technology Hyderabad Researchers are using computational methods to understand the factors and impediments in incorporating biofuels into the fuel sector in India. This work has been spurred by the increasing need to replace fossil fuels by bio-derived fuels, which, in turn, is driven by the dwindling fossil fuel reserves all over the world, and pollution issues associated with the use of fossil fuels.

The model developed by the IIT Hyderabad team has shown that in the area of bioethanol integration into mainstream fuel use, the production cost is the highest (43 per cent) followed by import (25 per cent), transport (17 per cent), infrastructure (15 per cent) and inventory (0.43 per cent) costs. The model has also shown that feed availability to the tune of at least 40 per cent of the capacity is needed to meet the projected demands.

A unique feature of this work by is that the framework considers revenue generation not only as an outcome of sales of the biofuel but also in terms of carbon credits via greenhouse gas emission savings throughout the project lifecycle.

This research was led by Dr. Kishalay Mitra, Associate Professor, Department of Chemical Engineering, IIT Hyderabad with his Research Scholar Mr. Kapil Gumte. The results of this work were recently published in the prestigious peer-reviewed *Journal of Cleaner Production*.

This Research Paper also won the 'Best Paper Award' during the Sixth International Conference on Advances in Control and Optimization of Dynamical Systems held at IIT Madras earlier this year, which was attended by large sections of the whole process systems engineering community of India.

**Speaking about the importance of this research, Dr. Kishalay Mitra, Associate Professor, Department of Chemical Engineering, IIT Hyderabad, said,** "In India, biofuels generated from non-food sources is the most promising source of carbon-neutral renewable energy. These second-generation sources include agricultural waste products such as straw, hay and wood, among others, that do not intrude upon food sources."



Biofuel technologies are evolving in India. The design and implementation of technological, regulatory and policy approaches and pricing strategy of biofuels depend on a deep understanding of the supply chain network. Models such as those developed at IIT Hyderabad allow the society to understand the effects of uncertainty in the network parameters on the demand-supply dynamics and can help policymakers devise and revise strategies to meet the future demands of biofuels.

India's Ethanol Blended Petrol (EBP) programme, launched in 2013, has been growing over the years. It is now mandatory in India to blend fuel grade bioethanol with petrol (gasoline) to reduce the burden of crude oil import. The current target is to blend bioethanol to levels close to 20 per cent with gasoline. In a move towards green energy, the government also hopes to replace 20 per cent of fossil-fuel derived diesel by biodiesel.

**Dr. Mitra and his team analysed the bio-supply chain network through computational studies.**

**Elaborating on this research, Mr. Kapil Gumte, Research Scholar, IIT Hyderabad said,** “We use machine-learning techniques to understand the supply chain network. Machine learning is a branch of Artificial Intelligence in which, the computer learns patterns from available data and updates automatically to produce an understanding of the system and predictions of the future.”

While the agrarian society of India provides ample opportunity to produce second-generation sources, meeting the 20 per cent biofuel blend requirement necessitates the development of a systematic and comprehensive bio-supply chain network that overcomes current technical, market and regulatory hurdles.

The team has considered multiple technologies available for bioenergy generation across several zones in the country and performed a thorough feasibility study using data of suppliers, transport, storage and production, among others, published by the Indian Government.

“The techno-economic-environmental analysis on country-wide multi-layered supply chain network and the use of machine learning techniques have helped us capture the uncertainty in forecasting demands and other supply chain parameters and their effects on the operational and design decisions in the long run,” **added Dr. Kishalay Mitra.**

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#### About [IIT Hyderabad](#)

Indian Institute of Technology Hyderabad (IITH) is one of the six new Indian Institutes of Technology established by the Government of India in 2008. In a short span of around a decade, the institute built on an imposing 570-acre campus. It has been ranked among the top ten engineering institutes in India for five consecutive years in [National Institute Ranking](#)



[Framework \(NIRF\)](#) released by the Ministry of Human Resource Development (MHRD), Government of India. The Institute was Ranked #8 in 'Engineering' category and Ranked #17 in 'Overall' category in NIRF Rankings 2020

The Institute was also ranked #10 in the first edition of [Atal Ranking of Institutions on Innovation Achievements](#) (ARIIA) introduced in 2019 by MHRD to systematically rank all major higher educational institutions and universities in India on indicators related to 'Innovation and Entrepreneurship Development' among students and faculties. IIT Hyderabad has been placed in 601-650 Ranking Band and secured 10th Position in India as per QS World University Rankings 2021. The Research Output of the Institute was ranked as 'Very High.' The Institute was also ranked among the 10 Best Institutes in India.

IIT Hyderabad has close to 211 full-time faculty, 2,869 students of whom 20 per cent are women, nearly 200 state-of-the-art laboratories and five research and entrepreneurship centers. The Institute has a strong research focus with more than Rs. 500 crore of sanctioned research funding while Ph.D. scholars account for about 30 per cent of total student strength. IITH students and faculty are at the forefront of innovation with more than 1,500 research publications and patent disclosures, 300 sponsored/consultancy projects and 50 industry collaborations. IITH has MoUs with 50 universities in the U.S., Japan, Australia, Taiwan and Europe. IITH has been pioneering change in pedagogy with fractal academic programs that atomizes course modules, encourage interdisciplinary learning spanning innovative technology, fundamental science, liberal arts and creative arts like photography, theatre and painting.

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