



## Valorizing waste from sugar and allied industries

Innovations in pretreatment,  
bio-transformations and intensification

[www.vwainnovations.org](http://www.vwainnovations.org)



## Partners



Indian Institute Of Petroleum



## Funders



Department of Biotechnology  
Ministry of Science & Technology  
Government of India



Innovate UK

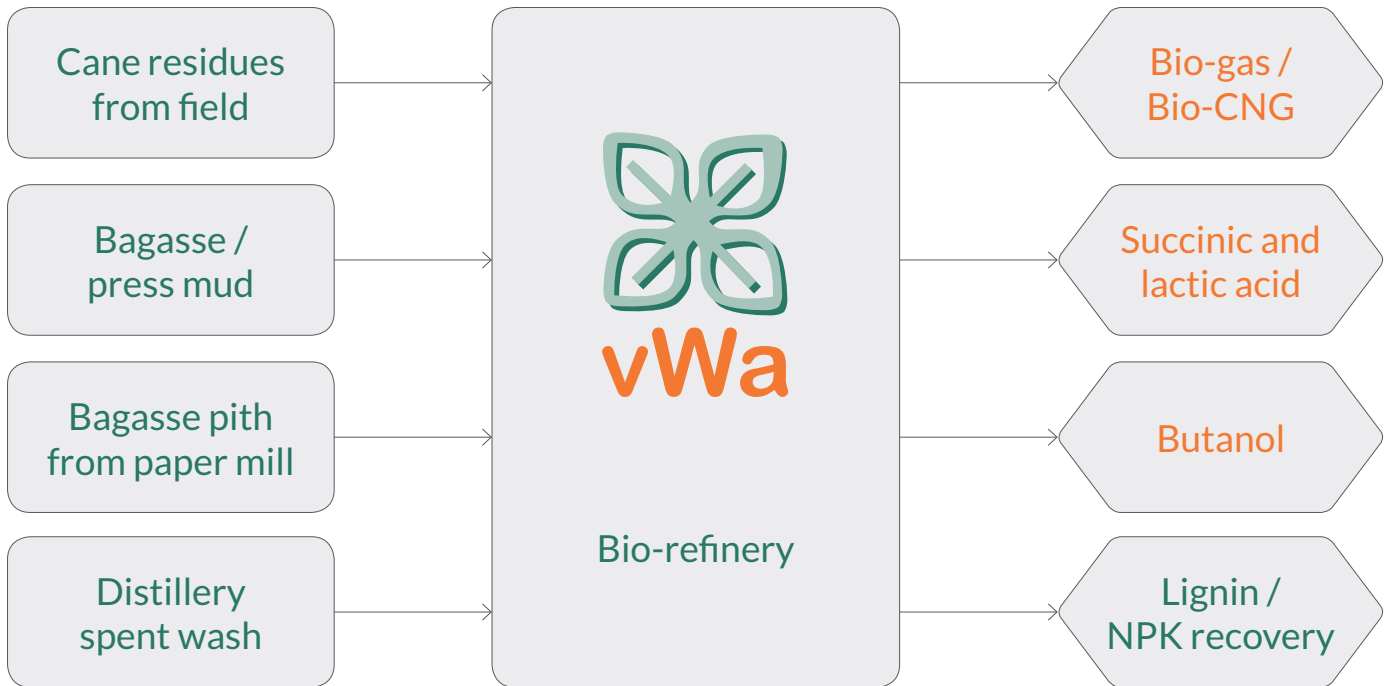
## vWa aims to valorize waste from sugar and allied industries in India

- Rural livelihood to > 60 million sugarcane farmers/ workers
- India rank 2<sup>nd</sup> in sugar cane cultivation (~ 5 million hectares) and sugar cane production (~ 362 million ton) after Brazil
- Second largest agro-based industry after cotton
- More than 500 sugar mills + more than 400 distilleries
- Sugar: > 30 million ton; Alcohol: > 2.5 billion liters
- Overall revenue: > ₹800 billion

## Generates significant waste

- Bagasse: ~ 80 million ton
- Sugar cane trash: ~ 35 million ton
- Press mud: ~ 10 million ton
- Spent wash: ~ 25 billion liters

## Develop processes and products for valorising waste from sugar and paper industries



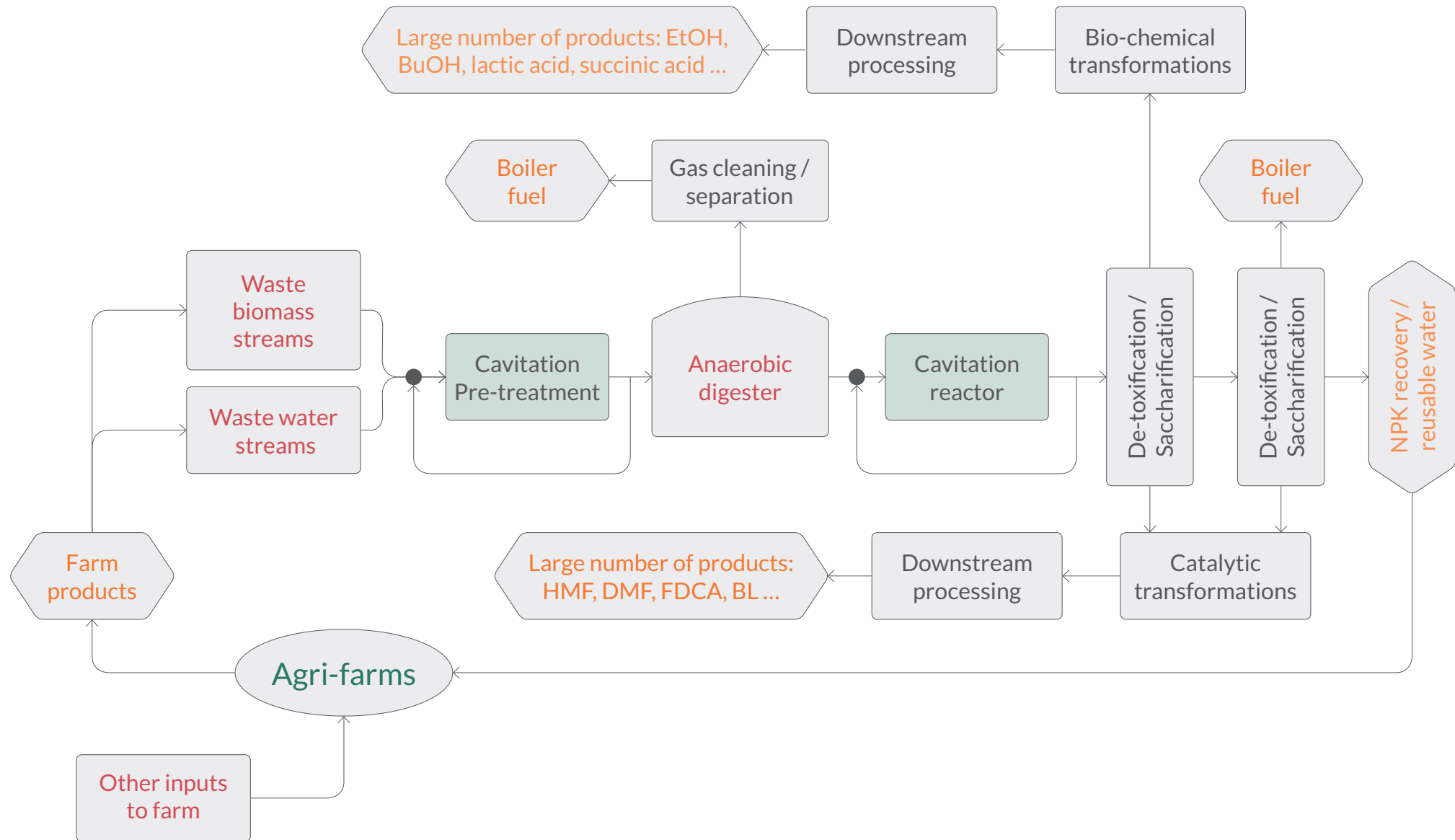
## Realize **sustainable and inclusive growth** by valorizing waste

- Contribute to 'Make in India' and 'Clean India'
- Contribute to UN sustainable development goals



**Will enhance overall wellbeing of large population**  
Will realize lasting impact beyond the project duration

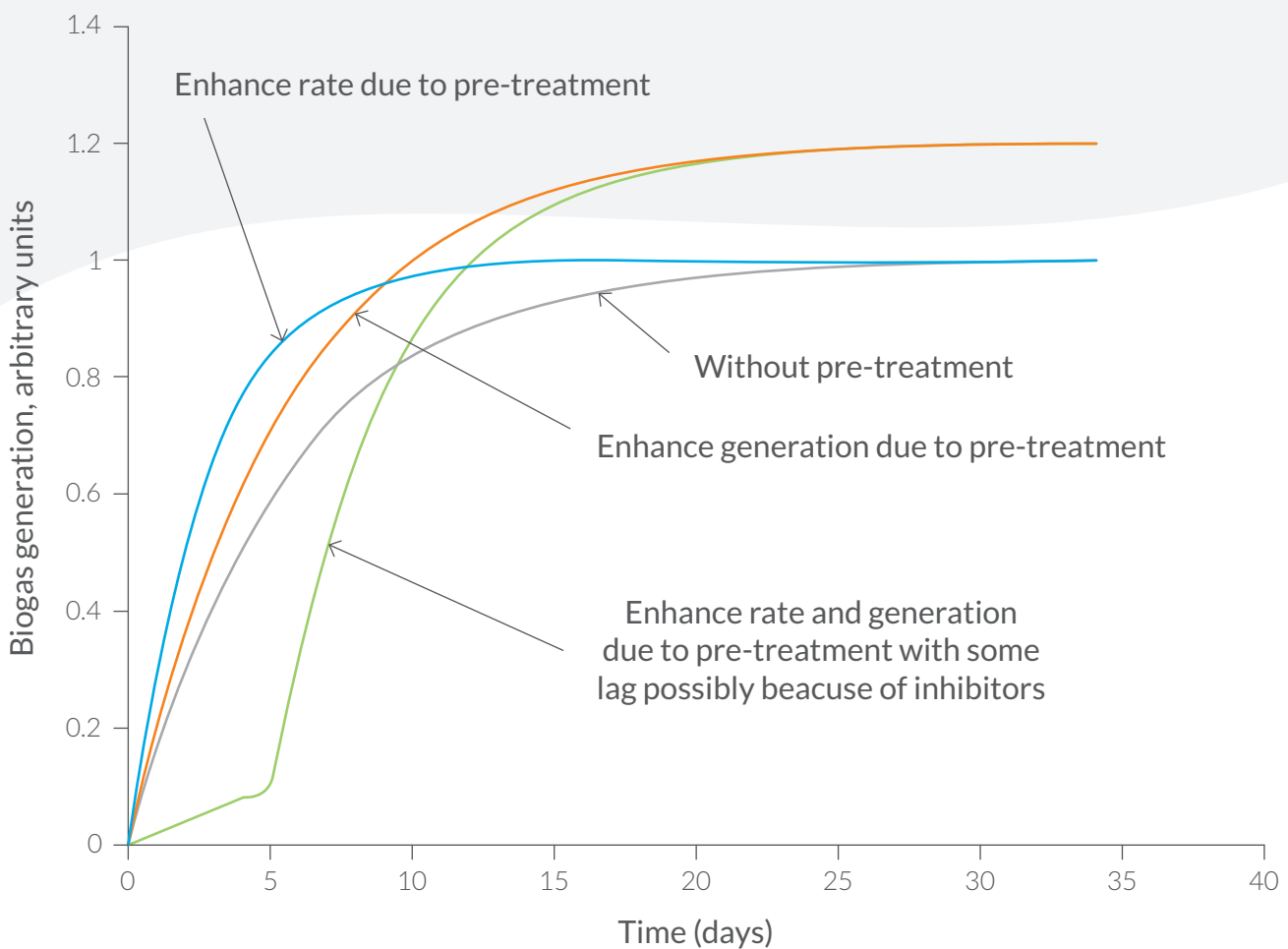
# Anaerobic Digester (AD) based Bio-refinery



Multi-product bio-refineries for a circular economy

## Intensifying anaerobic digester performance

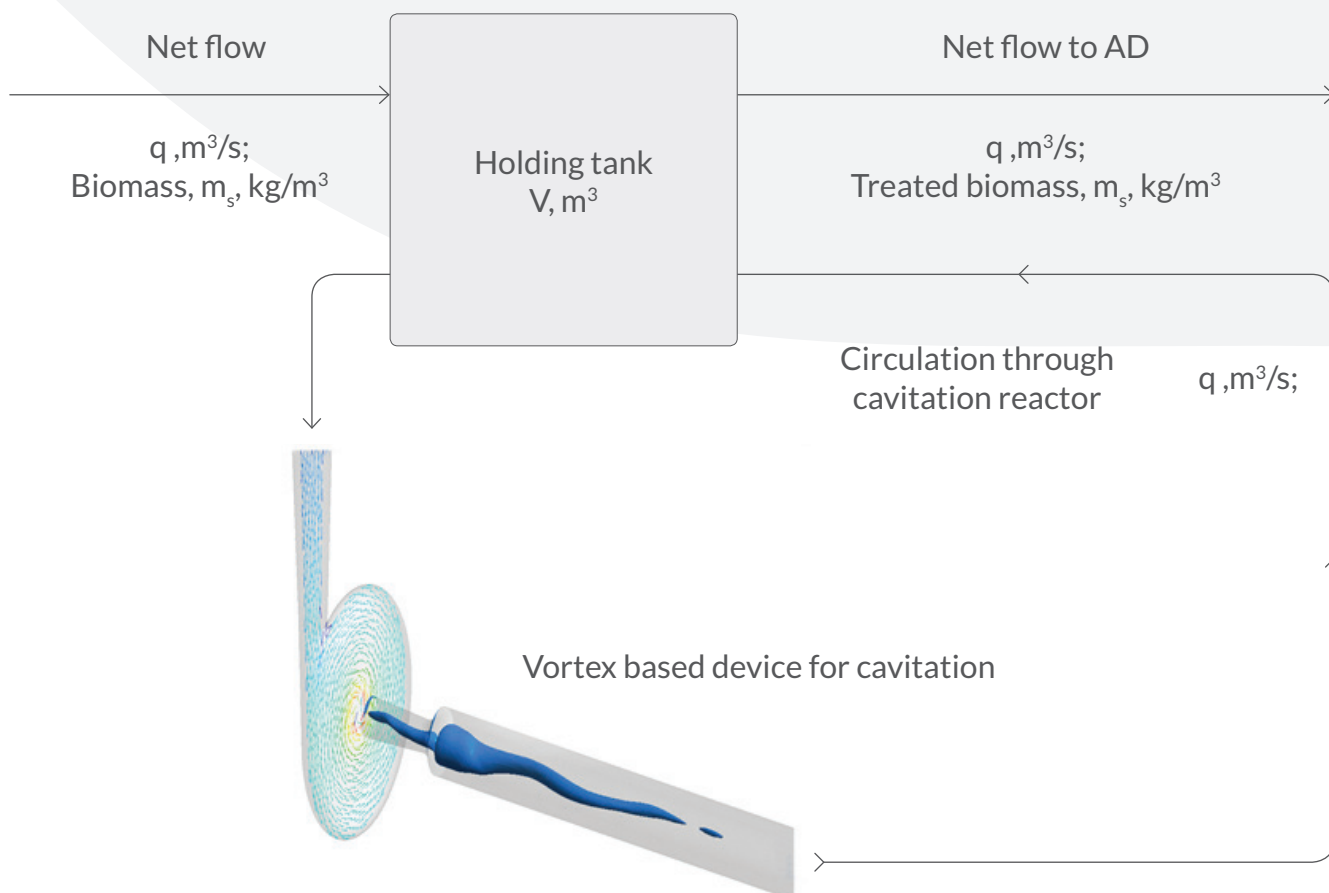
- Novel pre-treatment methods of lignocellulosic biomass using hydrodynamic cavitation
- Process intensification
- Reactor engineering and scale-up



Hydrodynamic cavitation based pre-treatment

## Hydrodynamic cavitation based pre-treatment

- Novel cavitation devices based on rotational flows
- No moving parts
- No small orifices / restrictions: minimal risk of clogging
- Cavity collapse occurs in vortex core – away from walls: minimal risk of erosion
- Intense contact of collapsing cavities and suspended biomass
- Ability to tailor characteristics and scale-up

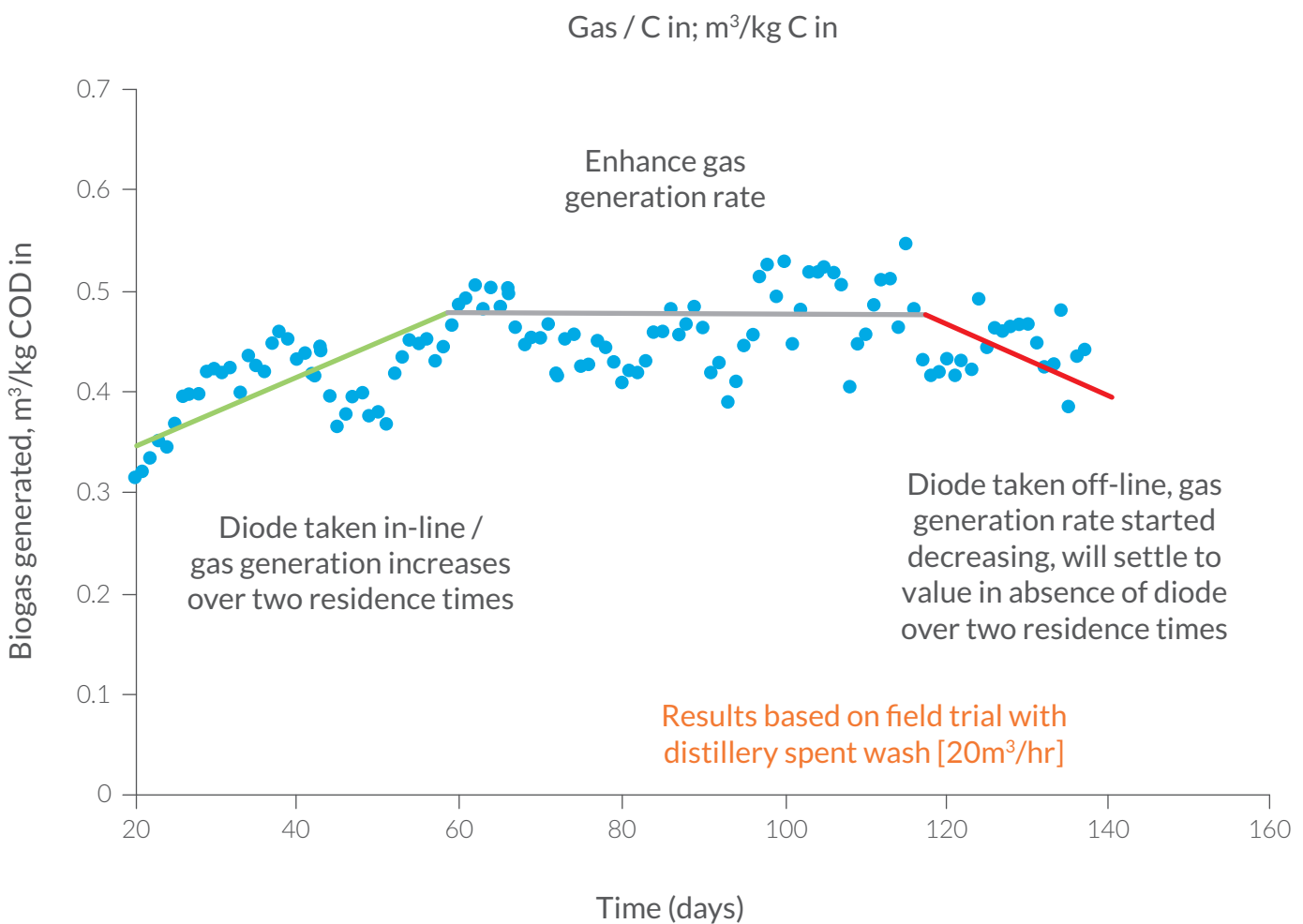


## Hydrodynamic cavitation based pre-treatment



## Application to spentwash digester

- Realized significant enhancement in biogas yield
- Spent wash COD: 120000
- Effectively addresses waste management problem and valorizes waste streams in a distributed & robust way



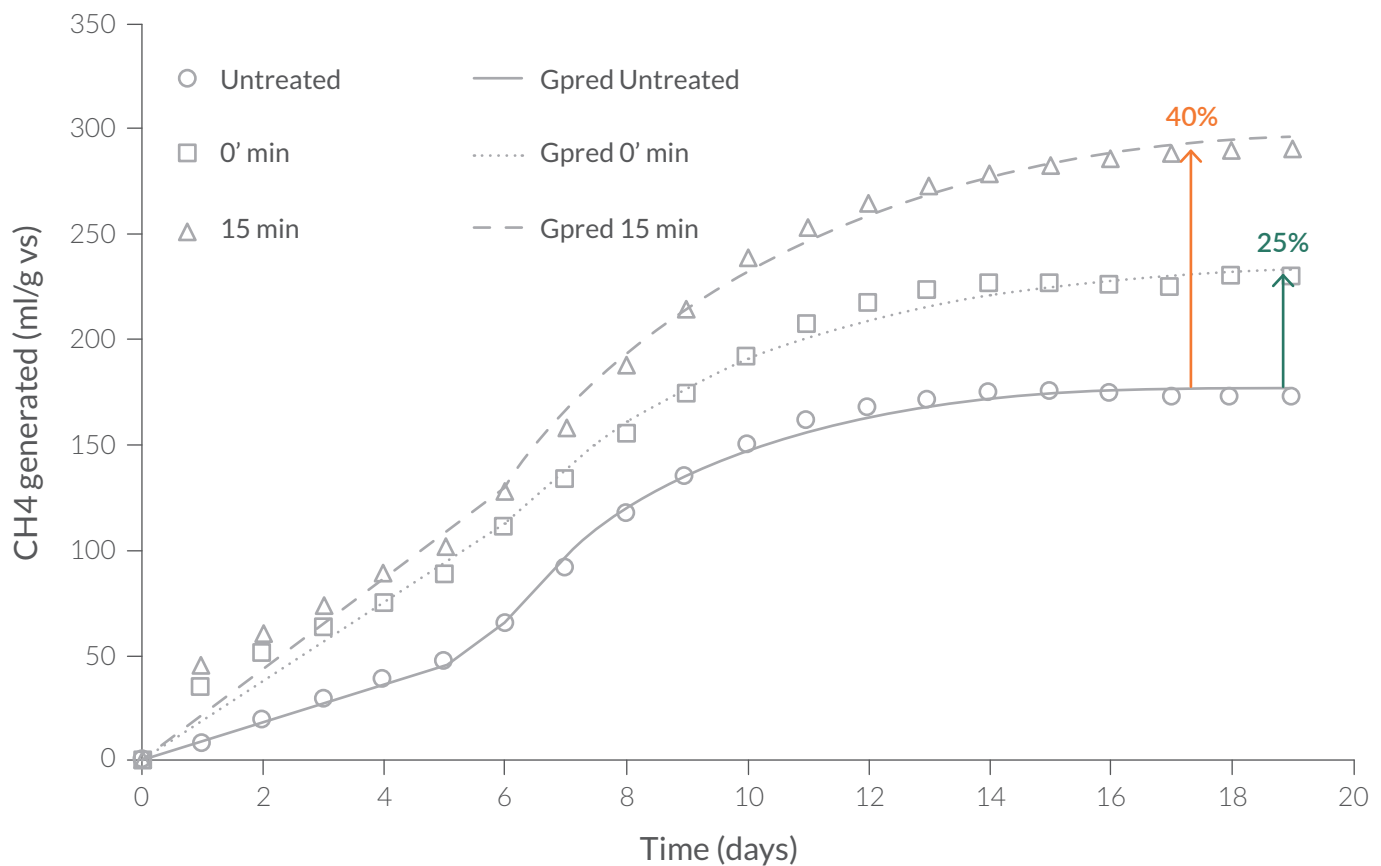
# Hydrodynamic cavitation based pre-treatment



## Multiple biomass may be treated:

Cane residues, bagasse, press-mud, spentwash ...

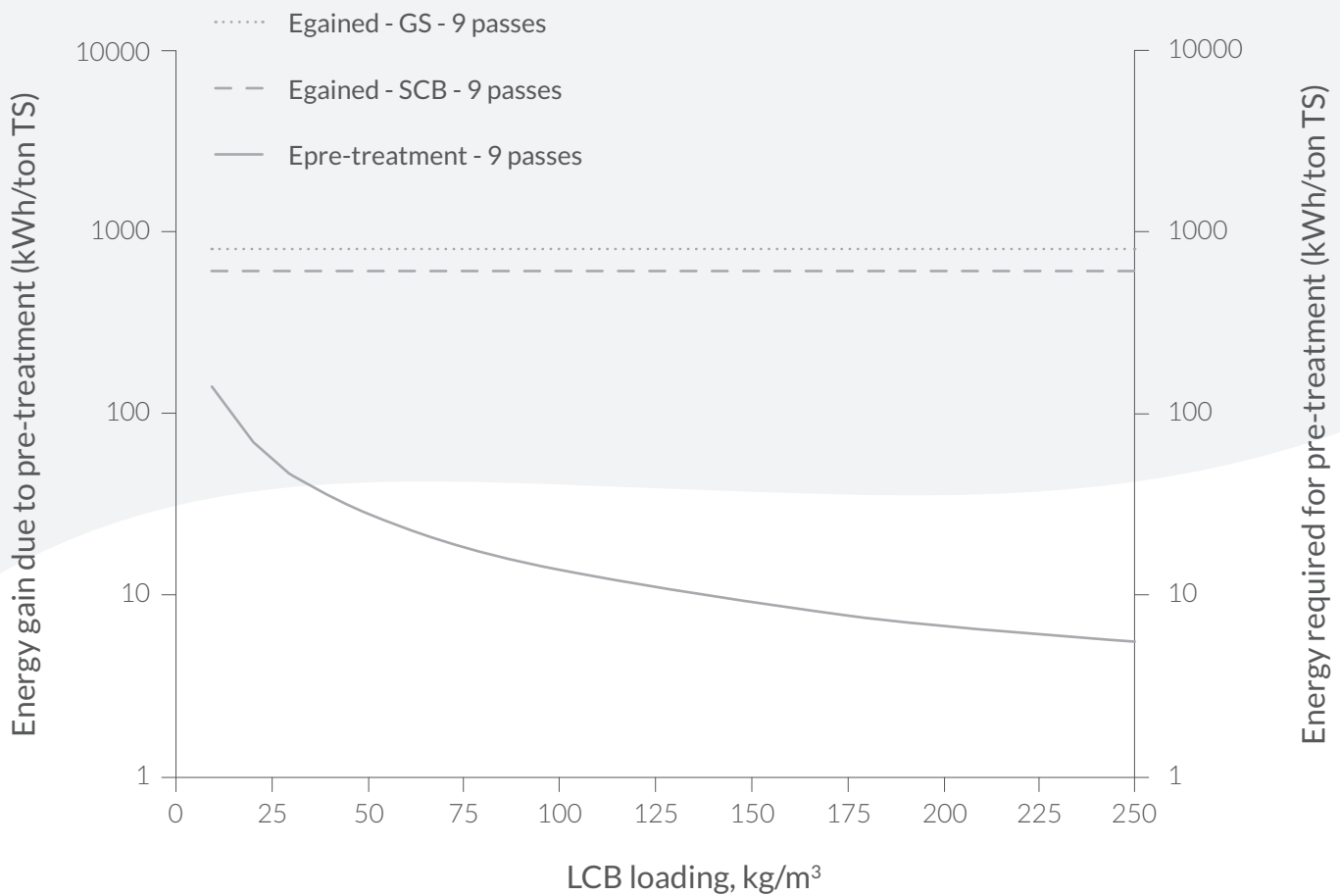
Soya grass, rice straw, banana stem ...





# Hydrodynamic cavitation based pre-treatment

Leads to significant enhancement in biogas yield with minimal pre-treatment costs



Hydrodynamic cavitation based pre-treatment can significantly boost overall economics of valorisation of waste biomass

Can be leveraged for SATAT and other initiatives of Government of India (<http://pib.nic.in/newsite/PrintRelease.aspx?relid=183787>)





## Key contacts

Professor Vivek V.Ranade  
Queen's University Belfast (QUB)  
[v.ranade@qub.ac.uk](mailto:v.ranade@qub.ac.uk)

Dr. Sanjay Patil  
Vasantdada Sugar Institute (VSI)  
[sv.patil@vsisugar.org.in](mailto:sv.patil@vsisugar.org.in)

[www.vwainnovations.org](http://www.vwainnovations.org)

