



Crop Residue Management through 2G Ethanol & CBG

Indian Oil Corporation Ltd.



THE ENERGY OF INDIA

9

Own Refineries

102

Pipeline Terminals

6,993

Consumer Pumps

120

Oil Terminals &
Depots

34,559

Retail Outlets (incl.
KSKs)

11

Bulk Explosive
Plants

126

Aviation Fuel
Stations

11,026

Kisan Seva Kendras
(KSKs)

1

Cryogenics Plant

101

LPG Bottling Plants

1,488

CNG Stations

4

Petrochemical
Plants

10

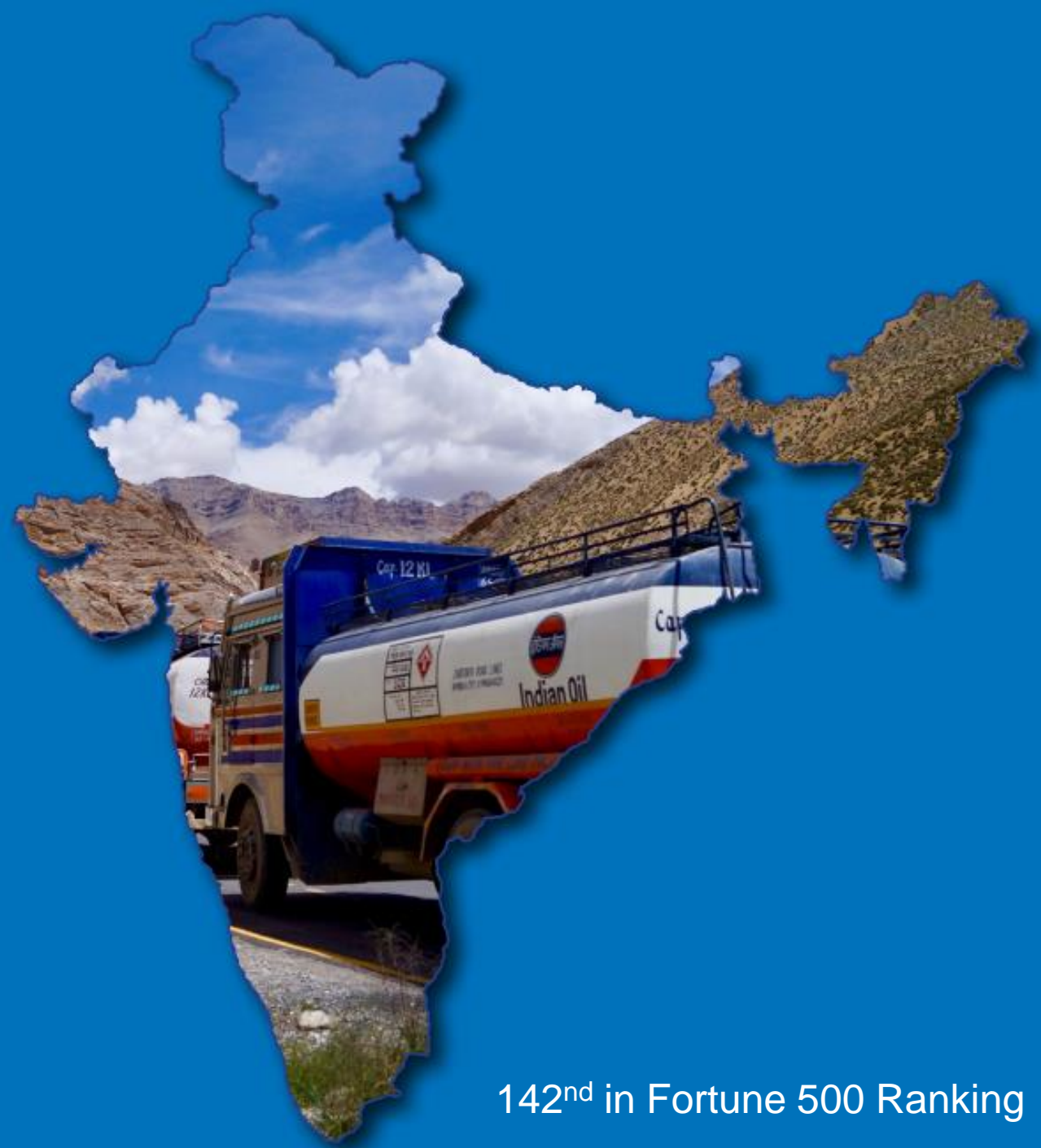
Lube Blending
Plants

12,813

LPG Distributors

2,179

EV Charging
Stations



142nd in Fortune 500 Ranking

IndianOil's Goal -

BY 2046

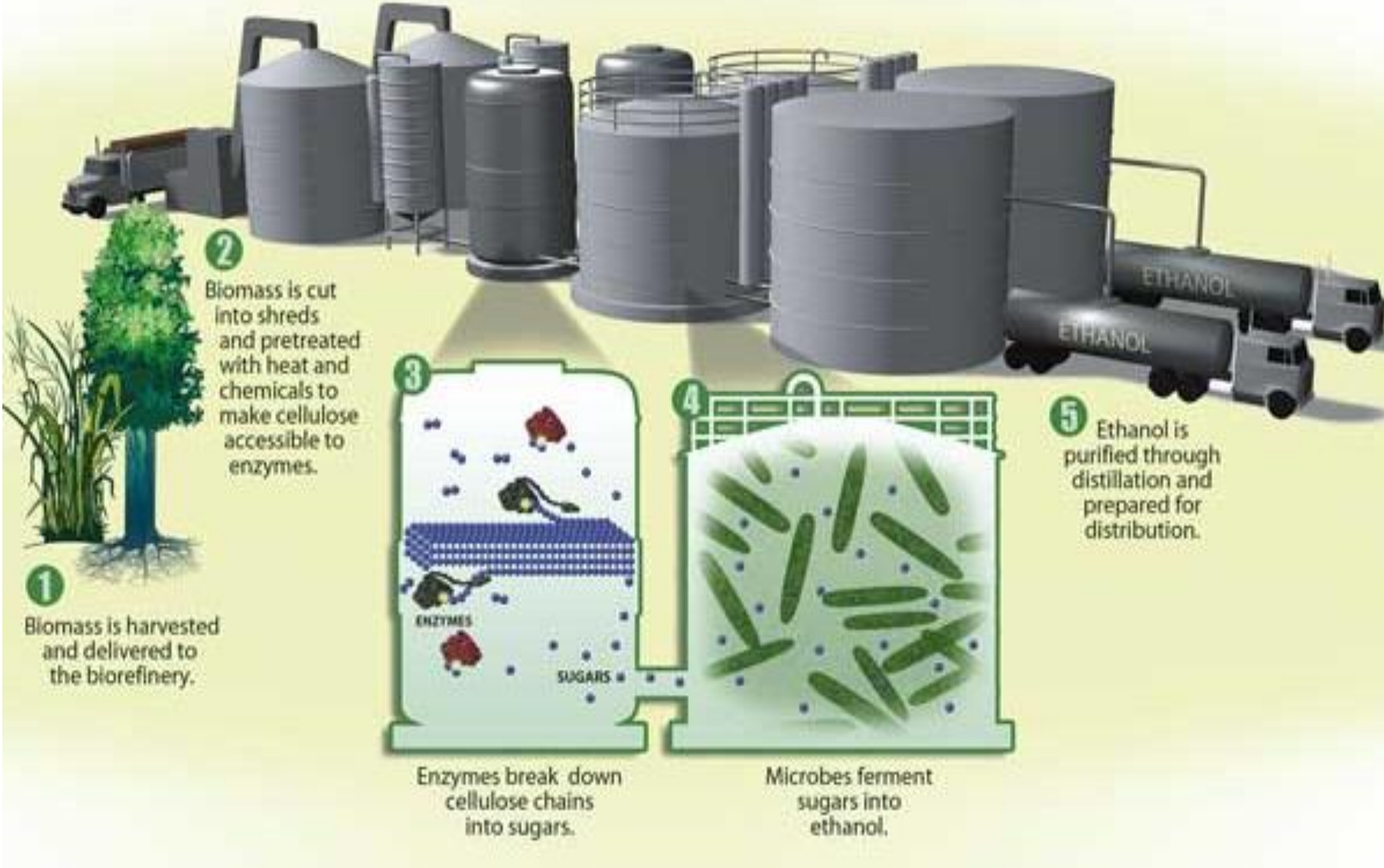
ACHIEVE NET ZERO OPERATIONAL EMISSIONS



Paddy Straw Management



2G Ethanol - Enzymatic Hydrolysis



2G Ethanol Plant at Panipat



**Capacity (Ethanol Production) : 100,000 Litres/day
(30 million litres/annum)**

**Green House Gas (GHG) emissions reduction: ~0.3
MMTCO₂e/annum**

Feedstock (Paddy Straw): 0.2 MMTPA

Project Cost: Rs. 909 Crore (USD 110 million)

**Viability Gap Funding under PM JI-VAN Scheme (Govt. of India): Rs
150 Cr (USD 19 million – 17%)**

Sustainable Aviation Fuel (SAF)



Agricultural and forestry residue

Technical Name

- Synthesized Paraffinic Kerosene (SPK)
- ASTM D7566-21

Climate Change mitigation

- Low carbon intensity (~60-80% GHG savings wrt fossil fuels)

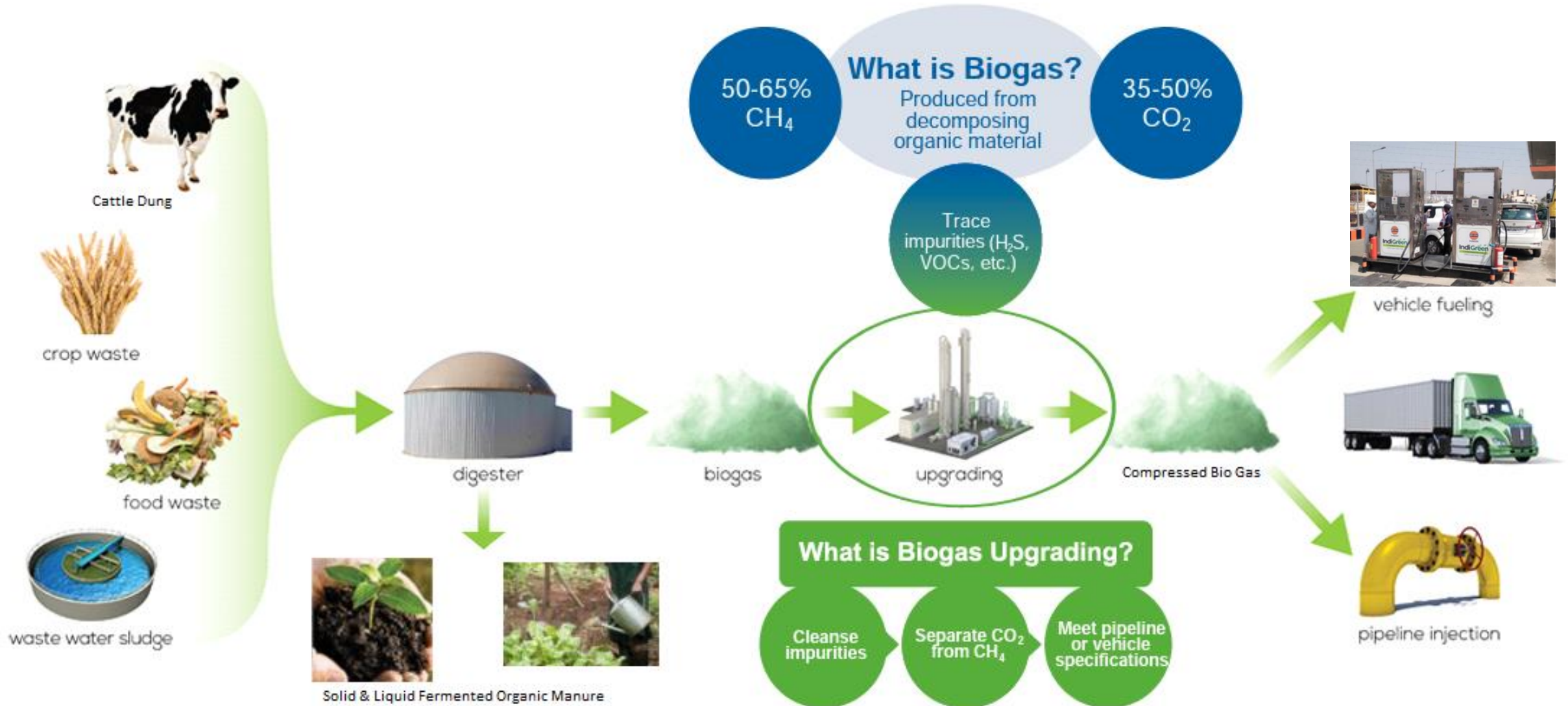
Drop in Fuel (blended upto 50%)

- ✦ SAF gives an impressive up to 80% reduction in carbon emissions during its life cycle.
- ✦ Can be blended upto 50% in traditional Jet fuel.
- ✦ No changes in engines of aircraft required.
- ✦ Low cost of adaption in comparison to hydrogen, which requires huge infrastructural change.

India SAF Requirement for International Aviation in India @5% blending in 2025 – 2026: 185 TMT

IndianOil is in discussion with 2 USA based companies for setting up SAF Plants

Compressed Bio-Gas (CBG) / Bio-methane / Renewable Natural Gas



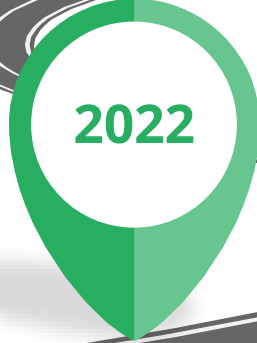
Sustainable Alternative Towards Affordable Transportation (SATAT)



SATAT initiative launched
Target – 5000 CBG Plants
CBG : 15 MMTPA
Organic Manure : 50 MMTPA
Total Investment – USD 22 Billion

First CBG Plant under SATAT – 5.9.19

Pune, Maharashtra (Food Waste)



Plants - 1315

Capacity – 2.3 MMTPA

Commissioned Plants - 40

Work in Progress - 50

CBG Plants - 5000

- Employment ~ 0.4 million
- Emission mitigation ~ 50 MMTCO₂e
- Climate Change mitigation
- Waste management & pollution control

SATAT initiative

CBG Plants Commissioned: 40
CBG supply initiated through Retail Outlets: 79



Verbio – Asia's Largest CBG Plant



Plant: Verbio India Pvt. Ltd., Sangrur

Feedstock: 300 TPD Paddy Straw

Capacity: 33 TPD CBG

Commissioning: April 2022



Paddy Straw to CBG Plant at Gorakhpur, UP

Project Brief

Feedstock

Paddy Straw : 200 TPD

Cattle Dung : 10 TPD

Press Mud : 20 TPD

Production

Compressed Bio-Gas (CBG) – 20 TPD (vehicle fuel)

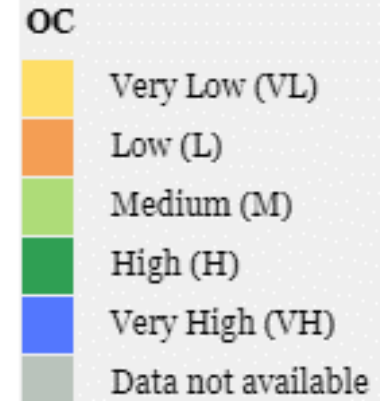
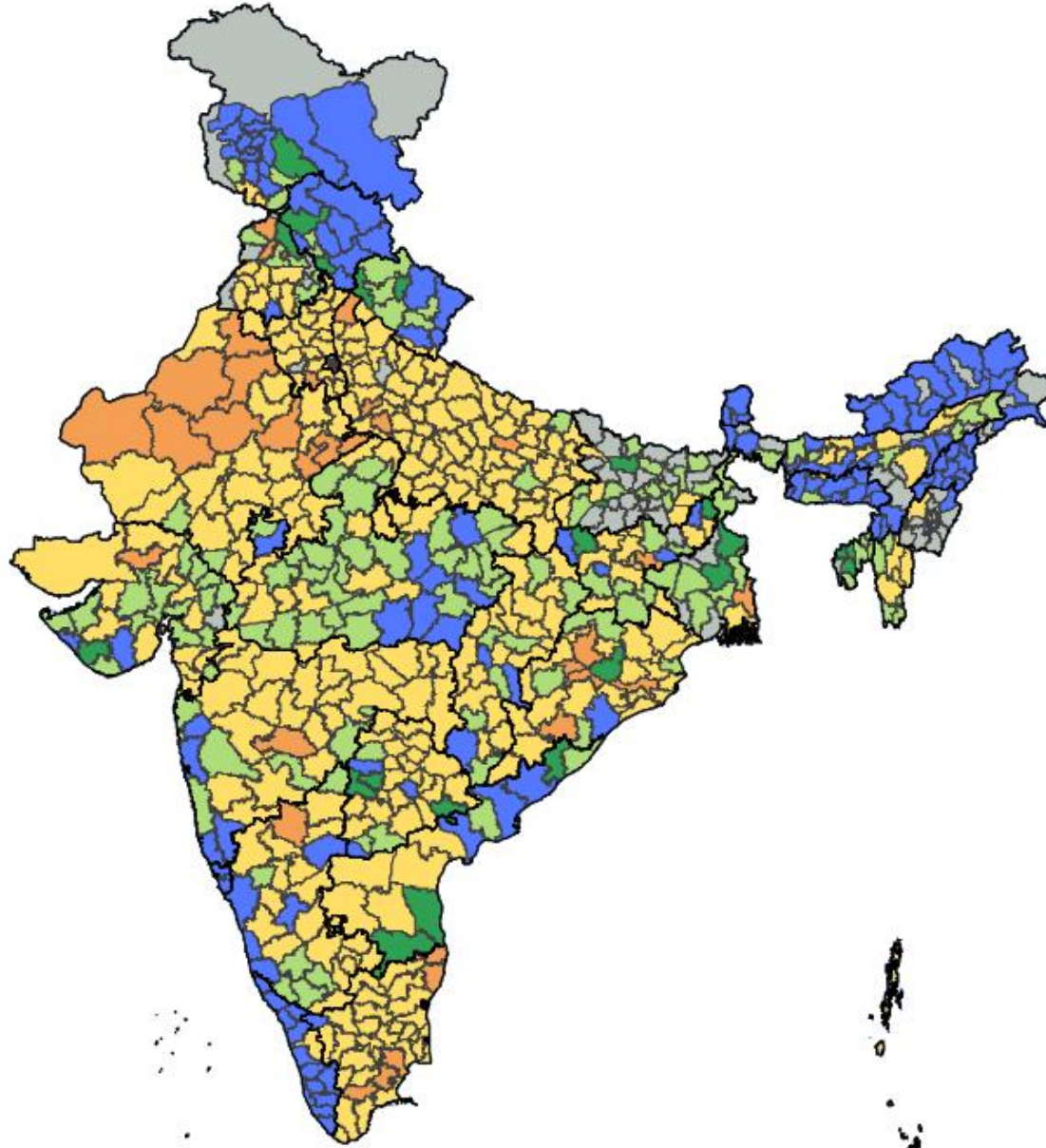
Bio-manure – 120 TPD

Technology: **IndianOil R&D Centre**

Project cost: **Rs. 130 Crore (USD 16 million)**



Organic Carbon in Soil



Low < 0.5%
Medium 0.5-0.75%
High >0.75%

Desirable limit :
1%

Source : <https://soilhealth7.gov.in/>

Solid & Liquid Fermented Organic Manure

Increase in crop yield

Replacement of chemical nitrogen and phosphorous

Restore natural soil fertility

Protection against drought and soil bourn diseases



Bharat Gold



BHARAT GOLD is a Microbial, Essential Nutritional Elements & High Protein Enriched Organic Manure. Due to dual type of composting process (i.e. anaerobic and aerobic) which generates high temperature, this leads to destruction of all weed seeds, harmful fungus bacteria and other microbes.

Product Advantage

- Balances soil Nutrition for Plants.
- Rich source of Organic Carbon for soil.
- Rich source of primary, secondary and trace elements
- User friendly due to powder form, apply through broadcasting
- Reduces addition of harmful chemical fertilizers
- Improves soil fertility by increasing N, P and K ratio
- Improves Organic matter, Minerals & Microbes in soil.

Dose & Method of Application

- 4-5 Bags (25kg) per acre can be applied in soil during land preparation /owing by broadcasting method.

Bharat Cs



Product Advantage:

- Consortium of Microbes. Safe and Environment friendly.
- Beneficial for Nitrogen, Phosphorous, Potassium and Zinc to the crops.
- It improves the soil pH and water holding capacity.
- Increases the yield by 15% to 25% and chemical fertilizers can be reduced by 30%.
- N.P.K.ZN- Bacterial Conjunction

Dose & Method of Application:

- 1 Litre /acre can be applied in soil.
- Can be repeated as per need.

Bharat Biogas



FOM is being exported to Kenya by Bharat Biogas, Anand

“Natural Farming” in Budget 2022



Glow Green

Green Earth

Requirements from Global Investors / Parties



Financing

Lowering Cost of Finance

- Low cost Green / Climate Financing for Biofuels projects through bilateral / multilateral financial institutions.
- Investments in aggregation & collection equipment's



Fermented Organic Manure

Enrichment

- Enrichment of FOM / LFOM
- Global markets for FOM / LFOM



Ethanol

Consumption

- Introduction of Flex Fuel Vehicles operating on E20-E100



2G Ethanol

Lowering production cost

- Supply of low cost & high yielding enzymes
- Biomass aggregation & collection equipment's

**Reducing the cost
of Biofuels projects**

**Carbon Credits /
Book and Claims
mechanism**

**Utilization of
Biofuels in Green
value added
Products like Bio-
polymers**



**Increasing yield
of Ethanol / CBG /
methane content
in CBG / Biodiesel
/ SAF**

**Enrichment,
Storage &
Application of
FOM / LFOM**

**Valorisation of by-
products like lignin,
DDGS, Glycerine,
etc.**

Thank you

**HAVE ANY
QUESTIONS**

