

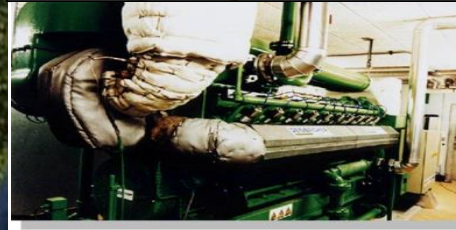
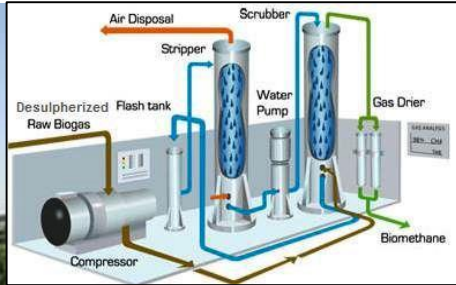
Average strength of layer birds in Namakkal zone in the last 10 financial years

(in lakhs)

2000 - 01	171.18
2001 - 02	212.71
2002 - 03	225.42
2003 - 04	219.19
2004 - 05	234.49
2005 - 06	307.34
2006 - 07	339.79
2007 - 08	367.35
2008 - 09	398.62
2009 - 10	407.34
2010 - 11	447.19
2011 - 12	500*

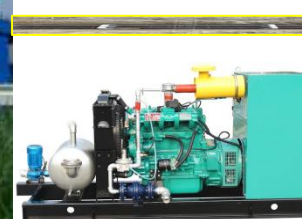


*average strength after expansion



AGRI DIGESTERS & BIOGAS – DRIVING GREEN JOBS IN INDIA

K. KRISHAN

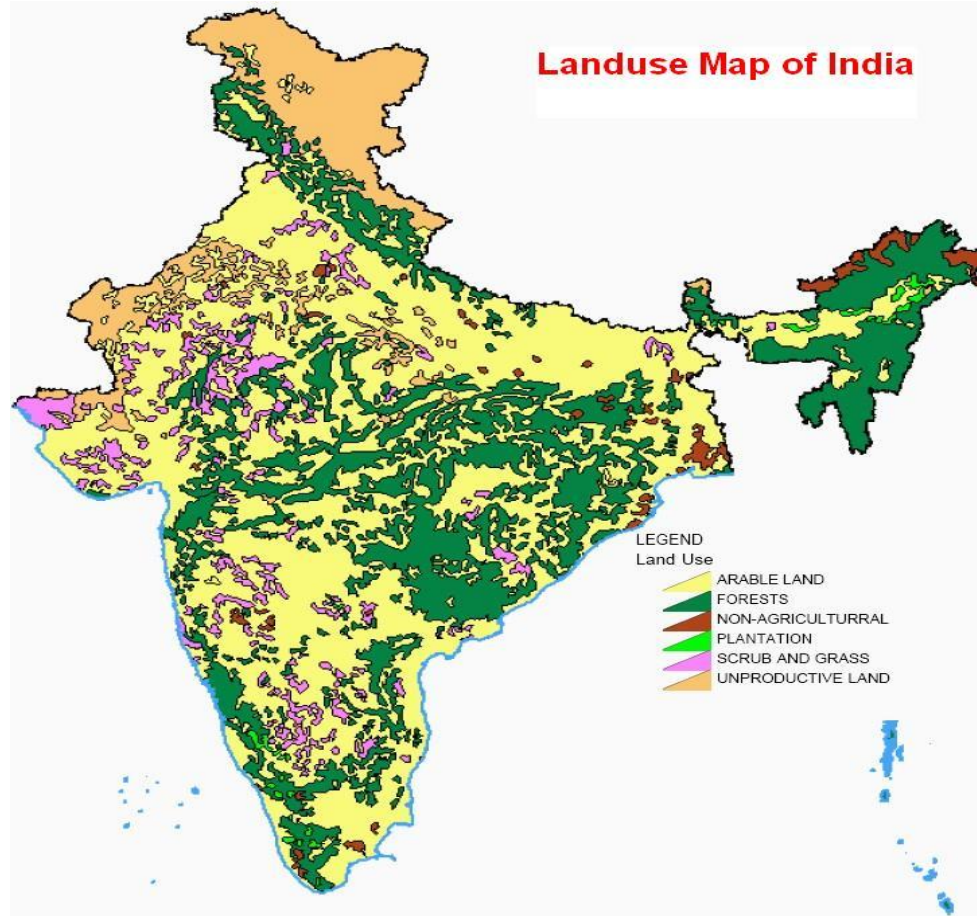




SCGJ | SKILL COUNCIL FOR
GREEN JOBS

INDIA - RURAL SCENARIO

Rural India remains an, essentially, agrarian society. Over 45% of land is arable



India has close to 200 million hectares gross cropped land, engaging 90 mill H/H's

India annually produces 170 million tons Milk, engaging 70 million H/H's

India annually produces 70 billion Eggs & 3.8 million tons Broiler meat

Agriculture linked Bio-Economy – for , low Carbon, Inclusive Growth

- With India's population expected to cross 1.4 billion by 2040, coupled with high GDP growth, the demand for food will rise. Yet, 90 million farmer households are in acute financial distress leading to discontentment & potential social unrest.
- It is, hence, imperative that the efficiency of agricultural systems is improved.
- Bio-economy approach results in efficient production of biological resources & conversion to food, cattle feed, compost, biofuels, & other bio-based products.
- A key element of Bio-economy would include optimal utilisation of agriculture waste .
- Advanced Bio-Technologies enable transition to “Farm linked Bio-Economy”. They are already able to, cost effectively, process agriculture residues to Biogas (or Biomethane + Liquid CO2) + Compost.

Pradhan Mantri Ujjwala Yojana – 100 million LPG connections

Many Challenges – Oil Cos plan 100,000 “LPG Panchayats”

2) **LPG panchayat will serve as an interactive platform for beneficiaries** under the Pradhan Mantri Ujjwala Yojana ([PMUY](#)) & Oil Co. officials, NGOs/ other stakeholders.

“During the Panchayat, some 100 LPG customers of nearby areas will share their problems and give suggestions but also narrate their experiences in using LPG cylinders”.

Also cover safe practices, quality of LPG Distributors service & availability of refill cylinders.

GM – LPG operations, Hindustan Petroleum said, **“People living in rural areas are still reluctant to adopt LPG, as they are having various misconceptions.”**

In FY 2016-17, 32.5 million new LPG connections (incl 20 million under PMUY) were released & LPG consumption increased by 9.8% to 21.5 million tons.

Rs 250 billion Capex to enhance Cooking gas infrastructure (24.7 MMTA by 2022).

As per IEA, Indian consumption of LPG, by 2040, will be 40 MMTA

Biomethane (from Farm Waste) can supplement LPG for multiple applications

UDAY (Ujjwala Discom Assurance Yojna) -24X7 electricity to all

Techno-Economic Challenges abound

Sep 26 2017 : The Economic Times (Bangalore)

Power to the Poor, to Renew Power

PM's pro-poor pitch on power holds promise

Power flows from the barrel of the gun, said Mao Zedong. Prime Minister Narendra Modi would appear to believe that political power for a second term of his government would flow from the power grid. At the extended meeting of the BJP National Executive, Modi outlined a vision building a power sector that would light every lamp in every home in every hamlet, and fire up every hearth as well, and the country would turn power surplus, preferably from renewable sources, the sun in particular. The speech did not hold out any great promise of new investment that would reverse economic deceleration but did underline the PM's commitment to the poor of the country and his efforts to alleviate their distress in sector after sector, focusing, in particular, on energy.

The PM's grasp of the energy sector and of detail in every sub-sector is commendable. He dwelt not only on new energy-saving products and technologies, and on the new thrust on renewable energy, whose costs are coming down virtually every passing day, but also on the macroeconomic benefits of slashing expensive oil imports, both through substitution of hydrocarbon energy by renewable sources and by means of saving energy. While he spoke of the need to curb greenhouse gas emissions, he acknowledged the reality that India would continue to use hydrocarbons and coal as major energy sources. But he committed to make these sectors work more efficiently and transparently, as via coal auctions. He outlined the upgradation undertaken in power transmission, although India is yet to adopt the ultra-high-voltage transmission technology that allows China to generate power efficiently and far removed from its population centres.

It would have been appropriate if the PM had also used the occasion to call upon the people to pay for the power they consume and told politicians to stop patronising power theft. For, it is this change in the political culture that the power sector needs far more than any financial reengineering of bankrupt distribution utilities represented by the Ujjwal Discom Assurance Yojana (UDAY).



Issues of “last mile connectivity” to 170 million rural households

Delivered cost of electricity @ 30 KWh/HH & Distribution Infra CUF < 30%.

“Biogas & Solar (hybrid)” an effective “Distributed Energy Generation” solution

Dharmendra Pradhan, Minister for Petroleum & Natural Gas

+ Ministry of Skill Development & Entrepreneurship

Dharmendra Pradhan who took over as the new Minister for Skill Development and Entrepreneurship, on Sept 4th 2017, said his priority would be to create an eco-system of jobs.

"Every year twelve million youth come into the job market. Our effort will be to coordinate with the state governments and other agencies to find employment avenues for them," he told reporters here.

After coming to power in 2014, Prime Minister Narendra Modi created the new ministry for coordination of all skill development efforts across the country, removal of disconnect between demand and supply of skilled manpower, building the vocational and technical training framework and skill up-gradation, he said.

Farm Waste management , under Green Business model, would generate millions of jobs & downstream Biogas/ Biomethane projects provide clean energy access.

Now facilitated by having Common Minister for "Petroleum & Natural Gas" as well as "Skills Development & Entrepreneurship".

Green Businesses linked Agriculture Biogas – enable achieve many SDG's



Farm linked Green Businesses meet 15 out of 17 SDG's (exceptions being SDG 11/Cities & SDG 14/Oceans)

SKILL COUNCIL for GREEN JOBS



Promoted by
Ministry of New and Renewable Energy (MNRE)
and Confederation of Indian Industry (CII)

SCGJ

SKILL COUNCIL FOR
GREEN JOBS

An Overview of SCGJ

SCGJ - MISSION

To capture the skilling needs for both service users and manufacturers/ service providers within the sector and implement a roadmap for a nationwide, industry led collaborative skills development initiatives that will enable meet India's potential for "Green Businesses".

GREEN BUSINESSES – KEY SECTORS




SCGJ | SKILL COUNCIL FOR
GREEN JOBS

ISO 9001 : 2015 Certified

Green Jobs requirement is on pan India basis, to meet Sustainable Development & Inclusive Growth Objectives

RENEWABLE POWER/ FUELS

 Solar (PV, Thermal) +
Storage

 Wind

 Hydro

 Biomass Power/
Cogen + CHP Units


 Biofuels & Biogas

ENVIRONMENT, FORESTS & CLIMATE CHANGE

 Solid Waste Management
Municipal
Agricultural & Animal Husbandry

 Water Management
Sewage Treatment & Re-use
Rain Water harvesting & Micro-
irrigation

 E-Waste Management

 Carbon sinks: TBO Oilseeds, under
Agro-Forestry + Plantation mode

 Clean Cook Stoves

SUSTAINABLE LIFESTYLES

 Green Construction
Green Buildings
Green Campuses

 Green Transportation
Electric Vehicles
Bio Fuels / Bio -CNG
vehicles

Key Growth Drivers

Skill India Mission



INDCs



National Solar Mission



Make in India



Smart Cities Mission



Swachh Bharat Mission



Green India Mission



National Water Mission



UJWAL : LPG Cooking access to addll 100 million households

SAUBHAGYA : Electricity access to 100% of households

FARMER'S INCOME : Double by 2022

OIL IMPORT DEPENDENCE : 10% reduction by 2022 & ELECTRIC MOBILITY

Training Capacity

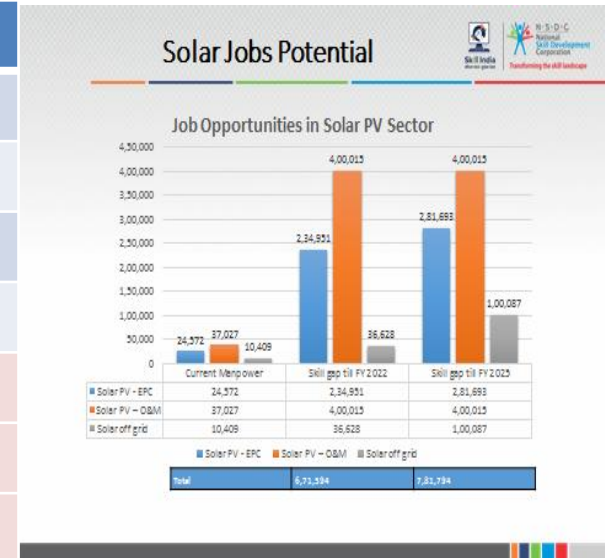
Skill Council for Green Jobs has created a robust ecosystem for Skilling in all its sectors:

- **More than 340 Training Centers across 24 States**
- **Over 550 Certified Trainers (1621 job roles)**
- **180+ Certified Assessors**
- **17,500+ candidates have been Trained and Certified**



Solar & Wind Power – 40% of installed capacity

Solar & Wind Energy	
Current Installed capacity of solar energy	16,157 MW
Current Jobs	about 72,000
Target installed capacity by 2022	100,000 MW
Additional Jobs to be created in Solar	about 6.70 lakh
Current Wind capacity addition by 2022	32,700 MW
Current jobs	About 60,000
Target installed capacity by 2022	60,000 MW
Additional jobs to be created in wind	50,000



- Major skilled manpower would be required for installation and maintenance of **Solar Roof top systems (Addition of 40,000 MW by 2022 targeted)**
- In the Budget, the Government has announces installation of **17.5 lakh SPV pumps for Farmers.**
- QPs of 29 job roles covering all aspects have been developed and approved

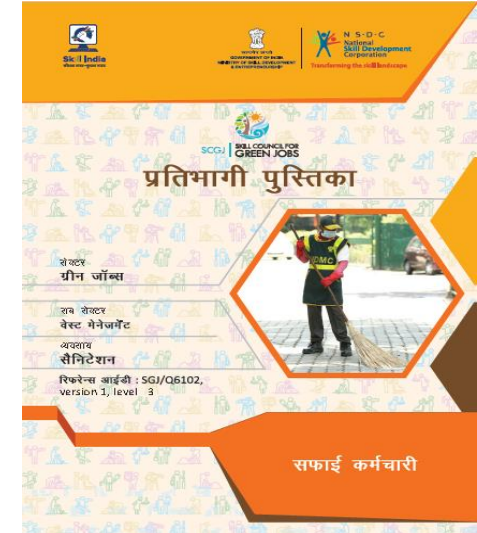
Swachh Bharat Mission – Waste Management

To address the issue of skilling and up-skilling in sanitation sector QPs of 7 job roles covering major aspects have been developed and approved

This programme is mainly focusing on RPL of Sanitation workers and waste pickers and recyclable waste collector and segregators

SCGJ, working with Indian Industry & Global Technology leaders, is catalysing evolution in efficient waste management, with appropriate mechanisation & use of digital technology.

Thus there will be dignity of labour as well as optimal processing/ recycling of waste, under Green Business framework.



Rashtrapati Bhawan Project – SmartGram Initiative - Green Businesses for Sustainable Rural Development

- SCGJ has actively participated in SMARTGRAM initiatives which were taken up in the 50 Villages, in Gurugram District, Haryana, adopted by Hon'ble President of India.
- Several RE interventions and skill programs were implemented, along with CSR support from IREDA & REC.
- Green Businesses include Solar PV Rooftop plants on Public Buildings, Drinking Water, Clean Cooking, Green Transport & Waste Mgt
- It's proposed to add Biogas Plant (feedstock of Cow Manure & Vegetable plants waste) + Biogas & Solar Hybrid Power Plant
- It is planned to replicate this SmartGram initiative, on pan India basis, adopting similar District wise approach.





एक कदम स्वच्छता की ओर

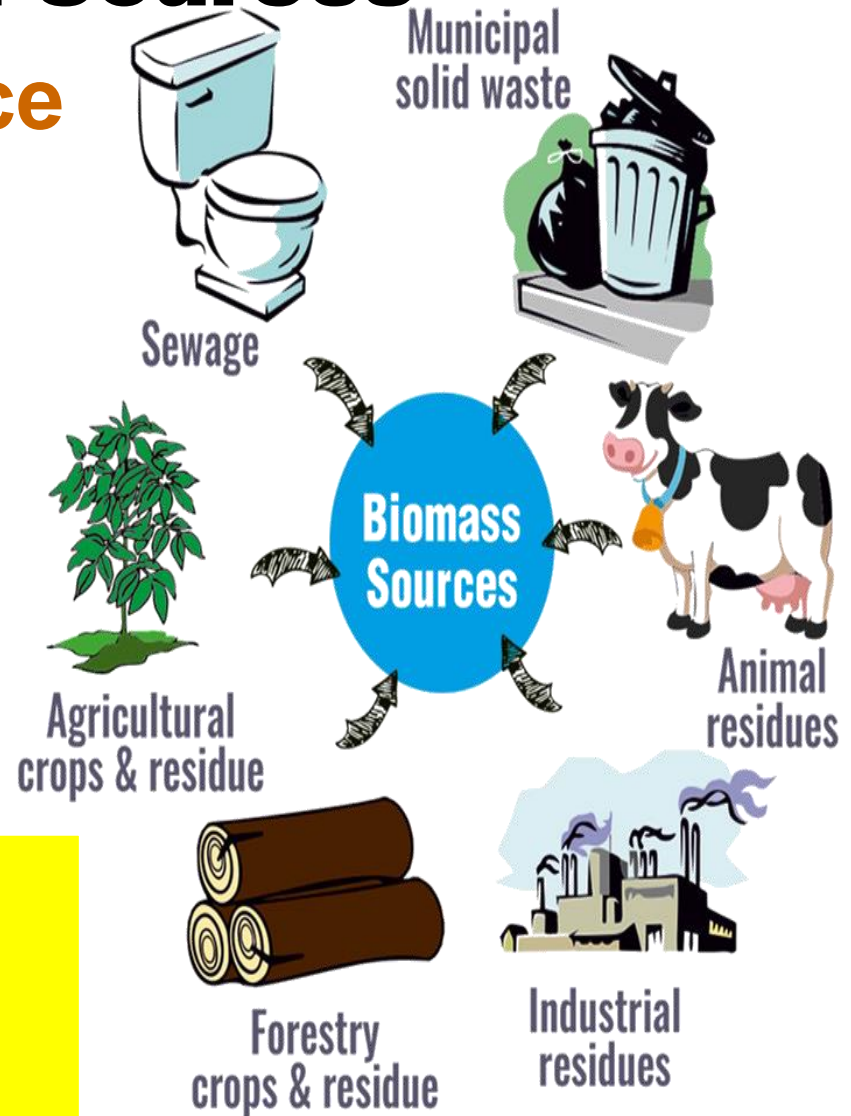
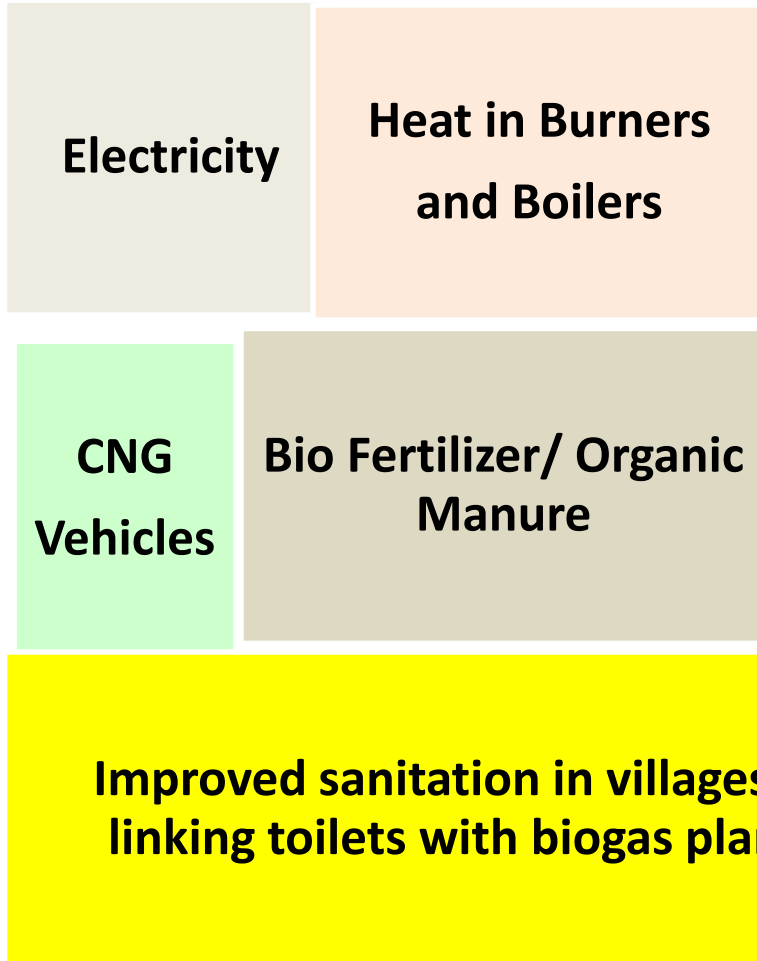
GOBAR-DHAN

Galvanizing Organic Bio-Agro Resources

Context setting Workshop convened on 22nd February 2018 by
Ministry of Drinking Water & Sanitation, Govt of India

Bio-Mass in India: Sources

A renewable resource



Source:

Bio-Mass in India: Potential



Waste to Compost

- **Compost:** conditions soil
- Allows for naturally **balanced pH** levels
- Enables retention of micronutrients needed



Waste to Energy

- **Animal Waste:** Energy potential **~75,000 MT of Bio Energy per day**
- **Agricultural waste:** In **UP alone**, power potential equivalent to **175.5 million ton coal/ year**



Waste to Compost



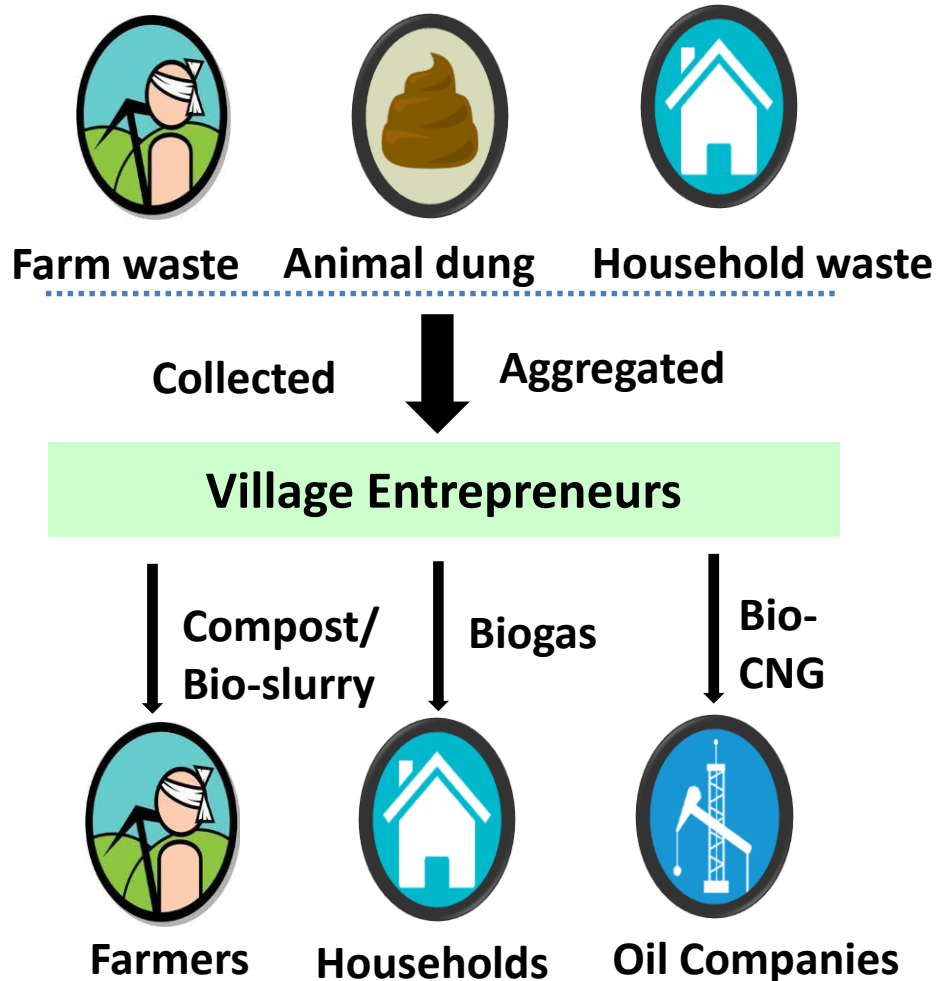
- ✓ **Three Bin** segregation at source: wet, dry waste, and domestic hazardous waste
- ✓ Composting the bio-degradable



Composting methods:

1. Vermi composting
2. Aerobic composting
3. Mechanical composting

Galvanizing Organic Bio-Agro Resources **GOBAR-DHAN**



GOBARDHAN will be implemented in selected Village Panchayat/s of 300 districts in first phase

Model 1: Biogas Enterprise

Dairy farms, Gaushalas, piggeries, poultries, etc

Govt subsidises 50%

Selection of District	Selection of Village	Selection of Entrepreneur	Bio-Mitras	Outputs
<ul style="list-style-type: none">✓ High cattle population & farm residue✓ Lead bank/ Financial Institutions✓ Technical knowledge partner	<ul style="list-style-type: none">✓ Entrepreneur✓ Cattle population✓ 1000 to 300 HH's✓ Gram Sabha resolution✓ NGO's	<ul style="list-style-type: none">✓ Land✓ Experience in biogas✓ Aggregates waste✓ Tie-up with knowledge partner	<ul style="list-style-type: none">▪ Bio-mitras (trained by SCGJ)▪ Fair Fees for Services to Entrepreneur	<ul style="list-style-type: none">➤ Households receive piped bio-gas➤ Solid waste of the village is removed➤ Farmers receive compost

Model 2: Bio-CNG enterprise

Open market for interested entrepreneurs

No subsidy

- Technology, location agnostic
- Entrepreneur aggregates waste

Outputs

- IOCL purchases bio-CNG at market rate
- Farmers receive bio-slurry at price
- Solid waste of the village gets picked up



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GREEN JOBS

**MODULAR SOLUTION for PAN INDIA IMPLEMENTATION
- PRE-FAB CONSTRUCTION WITH LONG LIFE MATERIALS**

***FACILITATES SUSTAINABLE & DIVERSIFIED FARMING -
ENHANCES FARMERS INCOME & LIVING STANDARDS***

INTEGRATED VILLAGE ENERGY UTILITY : THE CONTEXT

SCGJ has developed a holistic solution for sustainable & inclusive development of rural communities, comprising “Integrated Rural Energy Utility” which would support “Sustainable & Remunerative Farming”.

The “Integrated Rural Energy Utility” Projects would be implemented under 3 Main packages (each having 2 sub-packages), to enhance operational efficiency & align with relevant schemes of Union/ State Governments.

Furthermore, these Projects would facilitate “Value Addition” to Dairy & Horticulture produce, as well as provide “Market Linkages” (thereby increasing farmers income & insulating them from fluctuations in market prices).

Finally, SCGJ developed Green Business model would achieve multiple SDG’s & make significant contribution to GHG mitigation, thus enabling attract Long tenor/ low interest funds & Climate Finance.

INTEGRATED VILLAGE ENERGY UTILITY : PROJECT COMPONENTS

PACKAGE 1 : Manure Collection/ Supply & Compost Production/ Sales

(A) Cow Manure/ other Bio-waste Supply, outsourced to Village Entrepreneurs, with optimal mechanization and maintaining hygiene/ health standards.

(B) Production & sales of Compost, outsourced to Village Entrepreneurs, with optimal mechanization and maintaining hygiene/ health standards.

PACKAGE 2 : Biogas Distribution & Utilization as Clean (Gaseous) Cooking Fuel

(A) Supply of Piped, upgraded, Biogas & efficient Biogas Cook Stoves, outsourced to Village Entrepreneurs, maintaining high safety standards.

(B) Energy intensive, Dairy/ Vegetable processing units, managed by Village Entrepreneurs, maintaining high safety/ hygiene/ health standards.

PACKAGE 3 : Biogas Plant & Hybrid Biogas & Solar Power Plant

(A) Biogas Plant, based on prefab design & with long life materials, to ensure reliable & cost efficient supplies of clean, gaseous, energy to rural consumers.

(B) Hybrid “Solar & Biogas Power Plant”, providing “firm power”, between 6 am to 10 pm.

Package 1(A) - Cow Manure & Horticulture Waste Collection & organized Supply

i) Solid Waste Collection & Transport will be managed by local Entrepreneurs (functioning as Sub-Contractors & Sales Agents to Biogas Plant Owner) and funding from SCGJ arranged CSR Funds and schemes of

- **National Safai Karamacharis Finance & Development Corporation**
- **National Schedules Castes Finance & Development Corporation**
- **National Backward Classes Finance & Development Corporation**

Capacity building & mentoring will be undertaken by SCGJ and GAM (Grameena Abhivrudhi Mandali)

ii) Source collection would be undertaken by skilled labour, equipped with shovels & buckets/ gloves, face mask & boots to ensure hygiene as well as dignity of labour. Aggregation & transport to Biogas Plant would be in custom built Electric Carts, maintaining high sanitary standards.

iii) As illustration, for Biogas Plant (1,200 cum/day), daily supplies of 10 tons cow manure (30% dry solids) & 1.5 tons Horticulture waste (20% dry solids), deploying 6 Nos E-Carts.

iv) The Entrepreneur would, additionally, function as “Transporter” for bagged Compost.

Collection/ Aggregation & Transport of Solid Waste with high sanitary standards



Flexible containers for manure & other bio-waste (as required)



Bins for Plastics & other Recyclables



E-Carts for Transport of Manure & other Bio waste to Biogas Plant



Package 1(B) – Compost from Solids separated from Digester Effluent

i) Windrow Composting & bagging of Compost will be managed by local Entrepreneur (functioning as Sub-Contractor to Biogas Plant Owner) and funding from SCGJ arranged CSR Funds as well as schemes of

- National Safai Karamacharis Finance & Development Corporation
- National Schedules Castes Finance & Development Corporation
- National Backward Classes Finance & Development Corporation

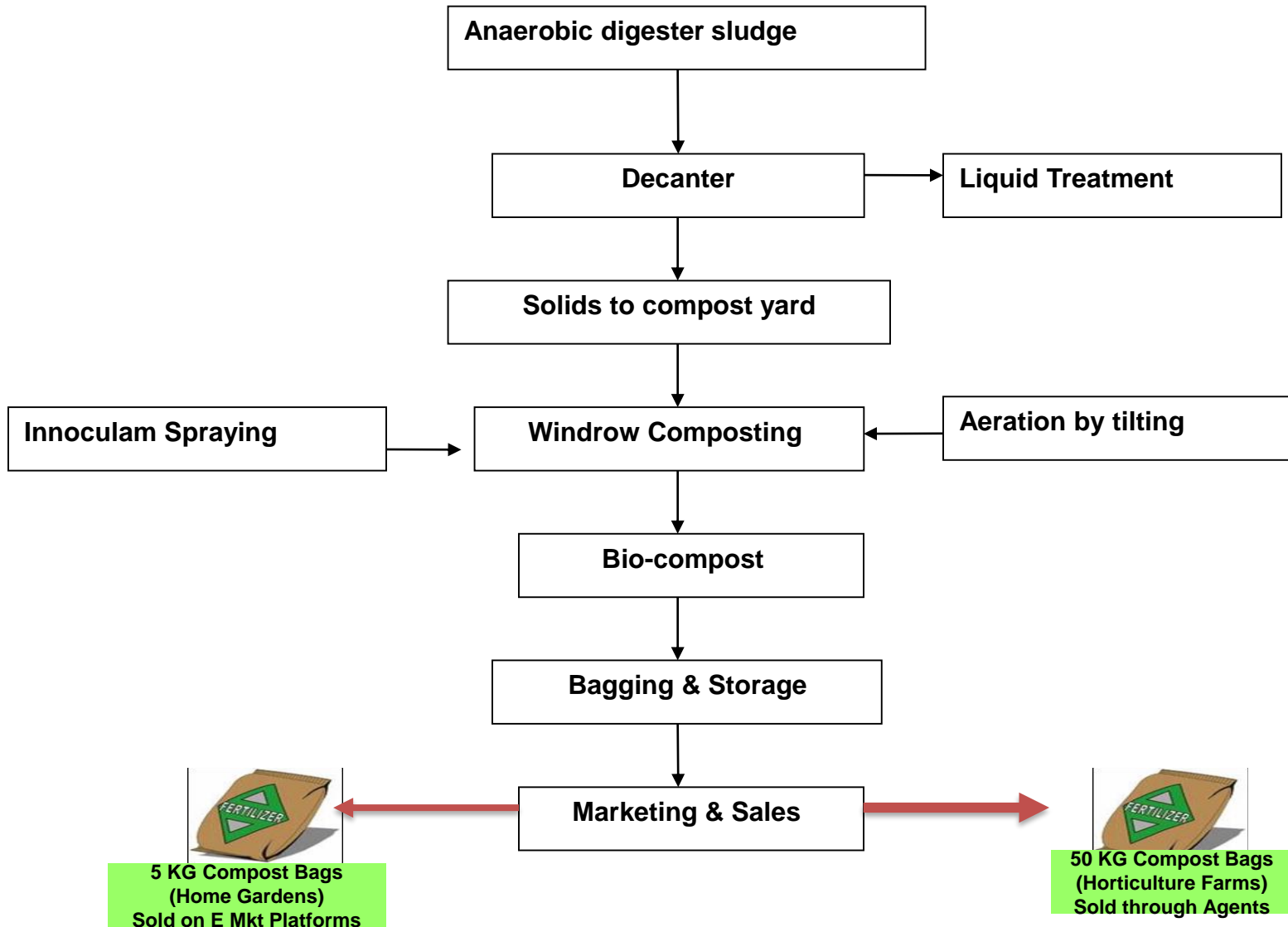
Capacity building & mentoring will be undertaken by SCGJ and GAM (Grameena Abhivrudhi Mandali)

ii) Collected Anaerobic digester sludge (ADS) with dry solids close to 30% (post decanter), will be shifted, in tipper trolleys, to the Compost yard.

iii) The ADS will be placed in long rows (windrows) & sprayed with bacterial inoculum for fast degradation, arrest odor, reduce flies. ADS rows are 'turned' to improve porosity & oxygen content, facilitate moisture reduction & temperature control. Composting period of about 20 days, to decompose organic matter, produce stabilized residue & disinfect pathogens.

iv) The stabilised Compost (with > 75% dry solids) would be batch tested and bagged/ marketed in 50 Kg bags (for sale to Horticulture Farms) and 5 Kg bags (for sale to Home Gardens)

Windrow Composting - Schematic depicting Process Flow



Package 2(A) - Supply of Piped Biogas (PBG) & Efficient Biogas Cook Stoves

i) Supply of PBG & efficient Biogas Cook Stoves will be managed by local Entrepreneurs (functioning as Sales & Service Agents to Biogas Plant Owner) and funding from SCGJ arranged CSR Funds as well as schemes of

- National Backward Classes Finance & Development Corporation
- Debt Funds from Grameen Banks/ SIDBI
- Subsidy from MDWS/ MNRE

Capacity building & mentoring will be undertaken by SCGJ along with GAM (Grameena Abhivrudhi Mandali)

ii) Biogas upgraded to about 75% methane & stored at 10 bar pressure, will be supplied Houesholds/ Community Kitchens/ MSME's within the Village(s).

iii) The consumers will be provided Agnisumukh make Cook Stoves, with radiant heat technology, which have been tested in LERC and have been proven to have significantly higher heating efficiency than the conventional "blue flame" LPG Stoves. Hence, Consumers will have superior cooking experience as well as cost savings compared to "blue flame" LPG Stoves.

iv) PBG pricing will be benchmarked against replacement of LPG as per consumption norms in conventional "blue flame" cook stove. The consumer will have the added benefit of avoiding logistics & time delay issues related to replacement cylinders.

Agnisumukh – high efficiency Cook Stove (with radiant heat transfer)

Relatively low impact on Heat transfer while firing Biogas (75% methane)

Community Cook Stove



30% improvement over conventional LPG stove

Household Cook Stove



15% improvement over conventional LPG stove

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LPG Equipment Research Centre
 P.B. No. 1618
 Dooravaninagar, Bangalore - 560 016
 Tel : 91-80-2561-3145, 2257, 4035



TEST REPORT – COMMERCIAL BURNER AS PER IS 14612:1999

I. SAMPLE DETAILS

Report No.:IRB/1006
 Report Dt:02.04.15

Customer	Indian Oil Corporation Limited
Sample Particulars	14" ML 005 Cooking Range with Burner
Customer Ref / Date	BAO/LERC dated 19.01.15
Name of Manufacturer	M/s Agnisumukh
Date of Receipt	01.04.15
Date of Test Completion	02.04.15
Quantity Received	01
Brand Name	Agnisumukh
Condition of sample on receipt	Satisfactory
Remark	Nil

II. TEST RESULTS

1. THERMAL EFFICIENCY						
CI No.	Test Description	Test Method	Unit	Standard Requirement	Results	
					Test No. 1	Test No. 2
26	Thermal Efficiency	IS 14612: 1999 with adaptation	%	45% Minimum	65.88%	68.95%
Remarks		Meeting Requirements				

Prepared By

 (MEENAM VERMA)
 Sr. Research Officer
 Authorized Signatory

Verified & Approved By

 (C N RAJENDRAKUMAR)
 DGM LERC
 Authorized Signatory

Note: This test report is released subject to the Technical Terms and Conditions given on page 2 of this test report



PBG supplies to Households + Community Kitchens with high efficiency Cook Stoves.
Community Kitchens is an emerging need, in Schools/ Hospitals + even rural QSR's.
Piped Biogas availability will support Dairy/ Vegetable Processing units.

Package 2(B) – Production of Processed Dairy & Vegetables Products

i) Production of ‘energy intensive’ Dairy products will be managed by local Entrepreneurs, funding from SCGJ arranged CSR Funds as well as schemes of

- **National Backward Classes Finance & Development Corporation**
- **Debt Funds from Grameen Banks/ SIDBI**
- **Subsidy from MDWS/ MNRE**

Capacity building & mentoring will be undertaken by SCGJ along with GAM (Grameena Abhivrudhi Mandali)

ii) 1 cu m Biogas (75% methane) fired in Agnisumukh Community Cook Stove, will replace over 0.8 Kg of LPG in “Blue Flame” Cook Stove.

iii) Processed Food Products, would be those which are energy intensive, to arbitrage lower energy cost of Biogas & Heat recovery from Gas Engines. Farmers will get better price realization, on year round basis.

iv) Processed Food Products would be sold, with support of GAM, to Food Industry Majors/ Bulk Purchasers & partly sold on e-marketing platforms.

Farm Waste --> Biogas : enhancing Farm Productivity & Revenues



Cut Vegetables



Cold Storage & Pack House

Pesticides free
Vegetables/ Herbal
Plants + Pack House



Net House



Micro Irrigation

Compost from Biogas
Plant

Farmers facilitated to diversify income sources : Horticulture & Dairy *plus*

Enhance farm produce value : pesticide free vegetables & reduced antibiotics milk



Cows & Buffaloes

Ethno-Veterinary
Practices

Milk with
reduced
Antibiotics

Vegetable Plant Waste & Vegetable Waste (20 % DS)

Manure Management System -> Manure (30% DS)

Biogas Plant

FOOD PROCESSING UNITS

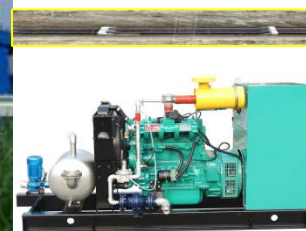
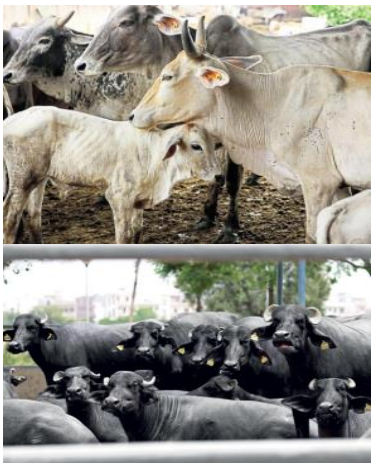
Reduced Antibiotic Milk : Khoa, Ghee, Paneer

Pesticide free vegetables : Packed Veg, Murabba





**SHREE KRISHNA CAPTIVE ENERGY PVT LTD –
BIOGAS PLANT +
HYBRID BIOGAS & SOLAR POWER PALNT**



MODULAR SOLUTION

1. PLANT RATING :

1,200 cu m/day Biogas (55% methane)

Biogas upgradation (75% methane), about 960 cu m/day, stored at 10 bar pressure

Hybrid Power Plant, with 40 KW Biogas Engine & 80 KWp Solar Panels.

Digester Effluent Treatment Unit, to separate solids and treat liquid to reduce TSS to below 100 ppm.

PBG (Piped BioGas) network, covering Households as well as QSR's/ Community Kitchens/ Food Processing Units within the Village(s)

Charging Stations for E-Carts (6 Nos) & E-Rickshaws (2 Nos) of the project ... which can be expanded, if 3rd Party demand exists.

Package 3 (A) – Biogas Plant

i) The initial, “showcase” projects are intended to be with Cow Manure as main feedstock & Vegetable Plant waste as support feedstock.

ii) The Plant owner would be SKCEL (Shree Krishna Captive Energy Pvt Ltd), which would sign MoU with local Panchayats (similar to Agreements that SKCEL had signed, in the past, with 5 Large Gaushalas in Haryana.

Technology provider was Envitec Biogas Ag, Engineering was completed & Permits obtained as Biogas Power Projects, which were not implemented due to PPA issues. These knowhow assets will, now, be put to productive use for Biogas projects, under the “Gobardhan” scheme.

iii) Modular rating of Biogas Plant is now envisaged as 1,200 cu m/day (about 55% CH₄), which will reduce to about 960 cu m (75% CH₄). Plant design is based on prefab construction with long life materials.

Package 3(B) – Hybrid “Solar & Biogas Power Plant”

i) The Hybrid Power Plant, to be owned by SKCEL, is intended to supply “firm power”, between 6 am to 10 pm.

The 80 KWp Solar Unit rating is envisaged to supply about 400 KWh/day. The 40 KWe Biogas Unit rating is envisaged to supply 400 to 600 KWh/day.

The “blended” tariff, fixed for 20 years, would be lower than energy costs of “Solar PV + Storage for 6 hours”.

ii) The Hybrid Power plant generation capacity would be aligned with energy needs of (a) Biogas Plant auxiliary loads (b) Battery Charging & Swapping Stations for E-Carts & E-Rickshaws (c) Dairy & Vegetables Processing Units

iii) Showcasing the techno-economic advantages, through successful operations of Solar & Biogas “Hybrid” power plants, could lead to large scale replication, supplying 800 to 1,600 KWh/day, as a robust Distributed Energy Generation solution for rural areas.

CONSTRUCTION RISKS MITIGATION

- (a) **Tanks** : would be of Pre-Fab design with long life materials, GLS (Glass Lined Steel) Tanks, from globally reputed manufacturer, viz Rostfrei Steels. The Digester Tank will be 1077 cu m volume, 16.82 m diameter & 4.85 m height. The Digester Effluent tank will be 50.6 cu m volume, 4.61 m diameter & 3.03 m height.
- (b) **Feedstock preparation** : in appropriate Mixing Tank, where substrate mix of cow manure & vegetable plants waste/ vegetable waste will be prepared, with appropriate %DS, and fed to the Digester
- (c) **Gas Engine** : will be of globally reputed make, with high efficiency.
- (d) **Electricals & Automation** : will be sourced from global majors with Indian operations (eg ABB, Siemens, Schneider).
- (e) **Mechanical BOP** : will be sourced from reputed vendors, with optimal pre-fab (including piping)

GLS (GLASS LINED STEEL) TANKS



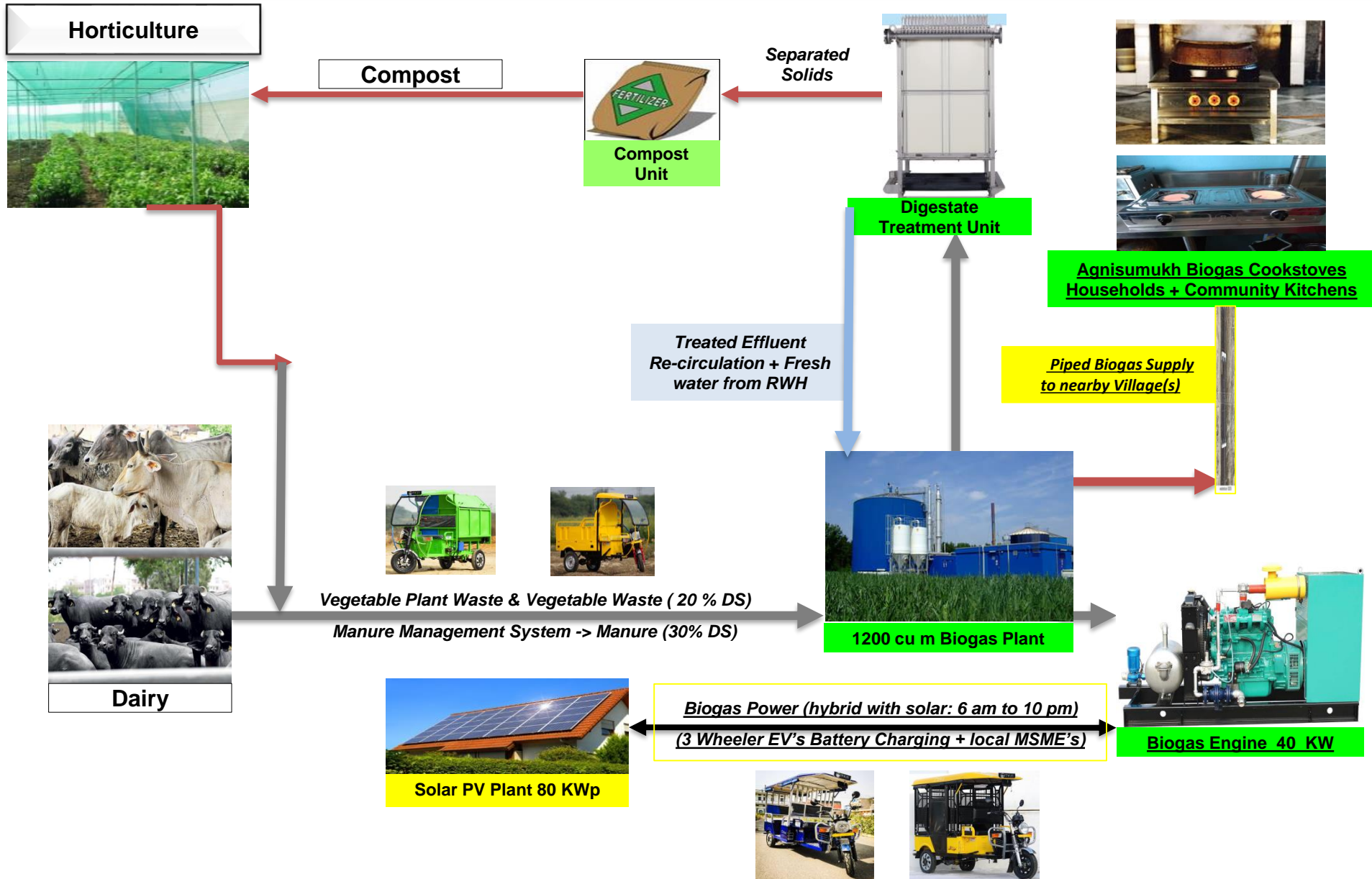
FEATURES:

- # Porcelain enamel chemically & mechanically fused to steel surface in a furnace.
- # Glass coating has high abrasion, temperature and chemical resistance properties.
- # Fast installation onto prepared concrete foundations, can be built in remote locations
- # **Proven 30+ year field service life**

PROJECT RISKS MITIGATION

- (a) **Manure supply chain** : would be managed by trained entrepreneurs, with efficiency optimised through appropriate implements for source collection & transport in e-Carts.
- (b) **Feedstock price escalation** : manure & vegetables waste procurement cost would be offset by sales of Compost (>75% dry solids). Compost supplies & “Market Access” support to Farm products, makes farmers “Stakeholders”.
- (c) **O&M costs escalation** : mitigated by adopting design with “long life materials”.
- (d) **Upgraded Biogas being market competitive with LPG** : through benchmarking Biogas price with that of LPG, with over 60% sales to Community Kitchens (getting supplies in 19 Kg cylinders, at non subsidised rates).
- (e) **Biogas & Solar hybrid Power being market competitive at “Tail End of Grid”** : much lower than stored solar energy (with 6 hours storage).

INTEGRATED VILLAGE ENERGY UTILITY → PROCESSING SOLID WASTE





SCGJ | SKILL COUNCIL FOR
GREEN JOBS

GREEN JOBS - FARM WASTE MANAGEMENT
FEEDSTOCK for CELLULOSIC BIOFUELS (Focus on BIOGAS)

Green Business - Farm Waste Supply Chain

Major Activities for Occupations

Agri Waste Collection & Aggregation

On-field Collection & Transport

Biomass Depot Operations

Material Handling & Storage

Cleaning & High Density Baling

Testing

Commercial Operations

Manure & Bio-Waste Supply Chain

Source Collection & Transport

Compost Yard Operations

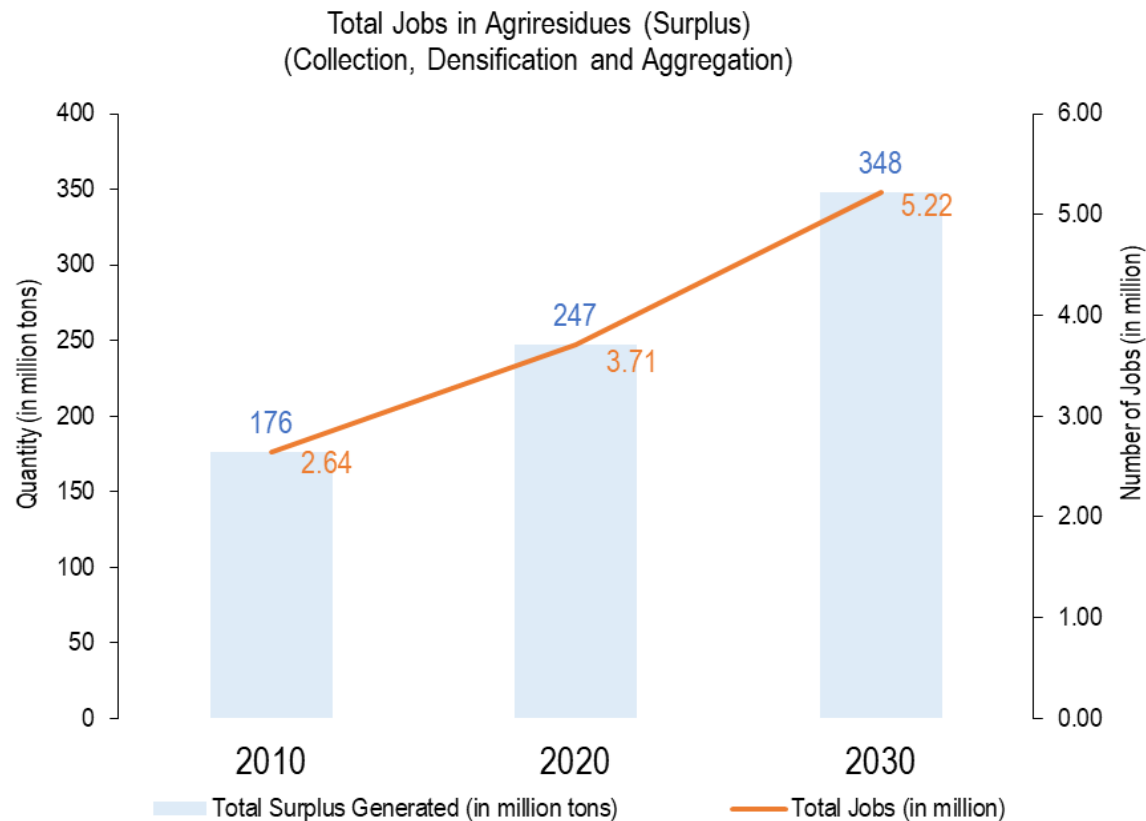
Material Handling & Storage

Composting & Bagging

Testing

Commercial Operations

JOBS POTENTIAL - MANAGEMENT OF FARM WASTE (AGRI RESIDUES)

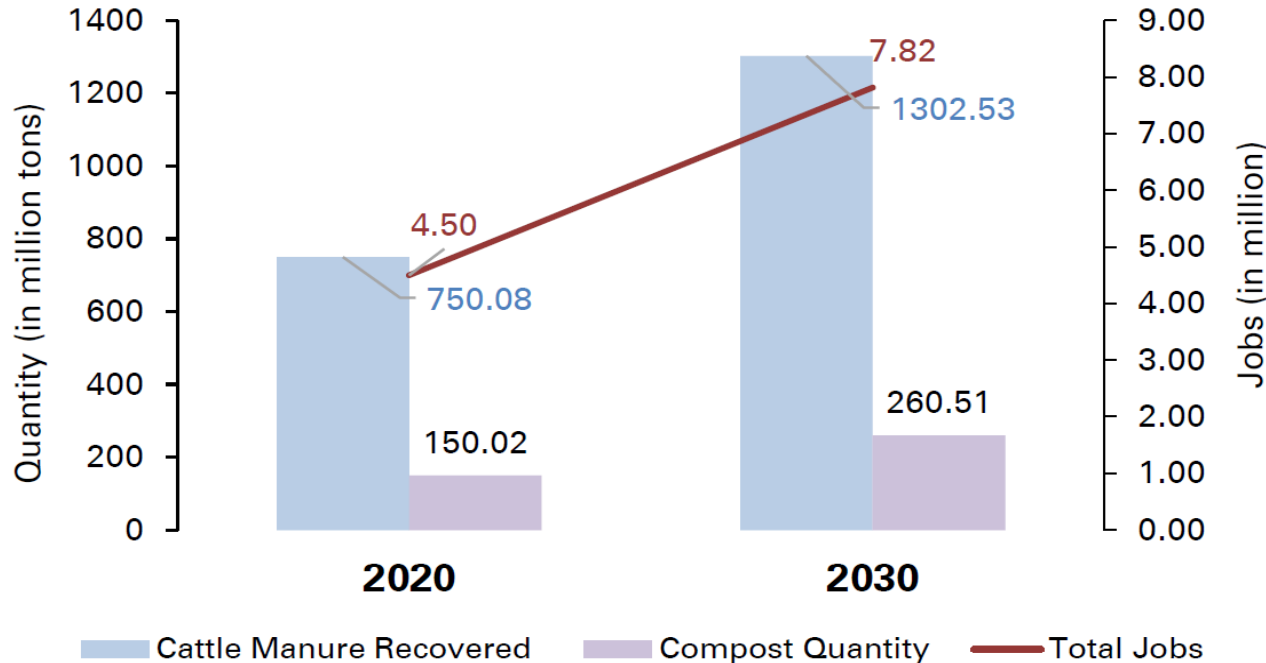


India's production of grains (+ pulses & cotton) is over 300 million MT/year.

The annual agriculture residues generated from above activity was 540 million tons, out of which the surplus was 176 million tons, or 140 million (dry) tons

JOBS POTENTIAL - MANAGEMENT OF FARM WASTE (CATTLE MANURE)

Potential Job Estimate in Cattle Manure Collection, Aggregation and Compost Production and Retailing

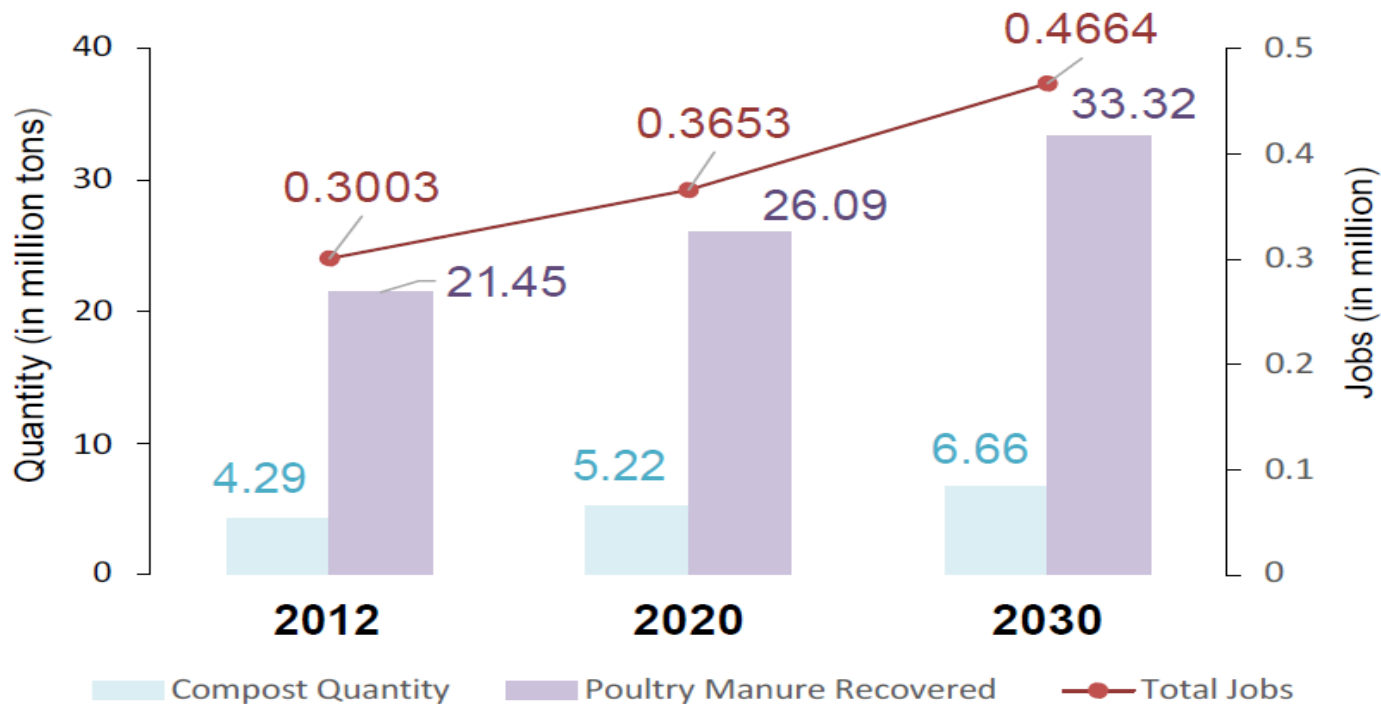


As per 19th Livestock census (2012), the population of milching cows/ buffaloes was 138 million, out of cattle total population of 300 million.

The annual cattle manure production is estimated as 1.67 billion tons (18% DS) – Recoverable manure assumed as 750 million tons in 2020

JOBS POTENTIAL - MANAGEMENT OF FARM WASTE (POULTRY MANURE)

Total Jobs in Poultry Manure Agregation and Compost Processing



As per the 19th livestock census (2012) & FAO estimates for increase in poultry, 2020 poultry (75% DS) is estimated as 30.69 million tons.

Recoverable manure taken as 26.09 million.