SSGE BIO-ENERGY

VALORIZATION OF AGRI-RESIDUES INTO BIOCOAL FOR SUSTAINABLE DEVELOPMENT

5th European Conference Biomass PowerON 2023

Taking place on 11-12 October in Stockholm, Sweden

Presented by: Dr. Dennis

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CORPORATE INTRODUCTION

SSBE Myanmar (Group) Co Ltd - wholly owned subsidiary of the HK based SSGE Bioenergy Co Ltd.

The principal activities of the group are R&D on thermal and agri-waste treatment technologies, procurement of agri-residues, processing of torrefied pellet for industrial market and non-torrefied pellet for FMCG market.

EUROPEAN STRATEGIC MARKETING PARTNER

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BRÜNING GROUP

Joint marketing program between SSGE and Bruening Group is being implemented. Strategic advantages of Bruening Group are highlighted as follows:

- Internationally well-established renewable energy trader.
- Growth through M&A strengthens the group global competitiveness.
- Extensive marketing network.
- Well-developed logistics network/truck/rail/sea vessel.
- Actively engaged in the promotion of SSGE’ s biocoal.
- Developed a list of diverse blue-chip customers.
- Knowing well the product market matrix concept.

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GEO-POLITICAL CONSIDERATION

A study of the influence of such factors as geography, economics, and demography on the politics and especially the foreign policy of a state.

Pre-military Coup D'etat

- SSGE was set up in Myanmar in 2019 prior to the military coup in 2021.
- Myanmar was considered attractive to foreign investors.
- Geopolitical environment was stable.

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GEO-POLITICAL CONSIDERATION

Post-military Coup D'etat

- SSGE has no direct or indirect link or business co-operation with the military junta.
- In spite of political unrest in the Northern part of Myanmar, SSGE daily operations are unaffected and continue to function normally.
- Export by private enterprises are not subject to sanctions or embargoes.
- Business operations are conducted under the strict Codes of Ethics and Professional Conduct and ESG guidelines.
- Contingency plan is in place to relocate production facilities to nearby countries.

(Sources: SSGE Internal Assessment of the Latest Business Trading Environment in Ayeyarwaddy Region, Myanmar, July 2023)

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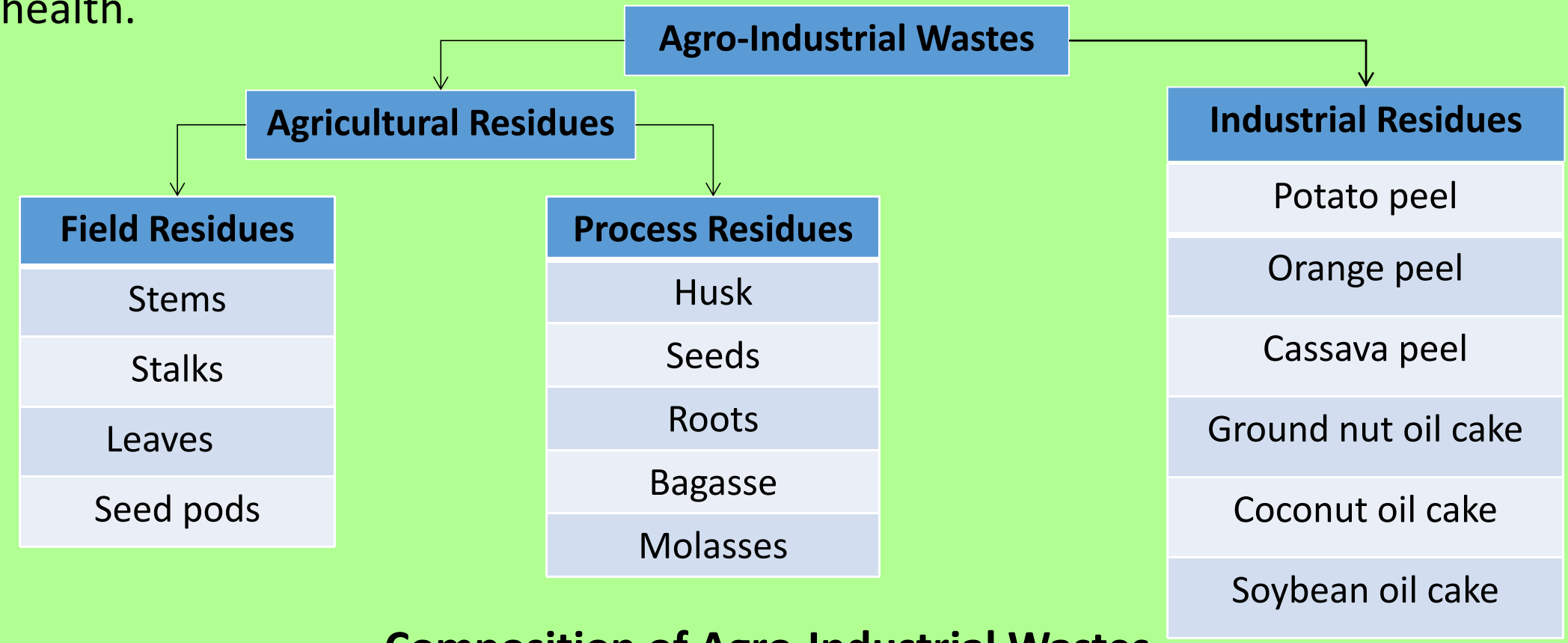
AGRO-INDUSTRIAL WASTE

Agricultural-based industries produced the vast amount of residues every year. If these residues are released to the environment without proper disposal procedure that may cause to environmental pollution and harmful effect on human and animal health.



Composition of Agro-Industrial Wastes

(Sources: Agro-industrial Wastes and their Utilization Using Solid State Fermentation, 2nd Jan 2018)

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Different kinds of Agricultural Residues

Rice Husk

Peanut Shell

Sesame Straw

Leaves

Bean Stems

Corn Stalks

Bagasse

Seed Pods

UTILIZATION OF AGRI-RESIDUES

Agri-residues consist mainly of cellulose, hemicellulose and lignin. Agricultural waste is poorly digestible and in unprocessed form not widely suitable as animal feed.

Overview of World's Agri-residues

- Unconfirmed secondary data from various sources estimated over 100 billion tons per year.
- Four most commonly grown agricultural crops worldwide are sugarcane, maize, cereals and rice account for 16.5 billion tons of which 80% (13.44 billion tons) are agricultural waste

(Sources: Agricultural Waste, Wikipedia).

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The consequences of overlooking Agri-residues

- More than 900 million tons of agricultural waste are buried in landfills annually.
  (Sources: Science Direct)

- More than 10.5 billion tons of agricultural waste are burned annually - releasing CO2, smog, particulate matter and ash which are detrimental to health and planet. (Sources: Google)

- Large scale agricultural waste burning resulted in seven million deaths annually including over 650,000 children caused by CO2, smog, particulate matter and ash. (Sources: World Health Organization)

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Overview of Myanmar's Agri-production

- Contributing nearly 1/3 of the country's GDP.
- Accounting to 30% of the total export earnings.
- Employing 70% of the workforce.
- 12.8 million hectares out of 67.6 million hectares of land in Myanmar are cultivated.(Sources: Google, 28th July 2022).
- Total crop production was about 58 million tons in 2020.
- Agri-waste was roughly estimated at about 46 million tons in 2020.

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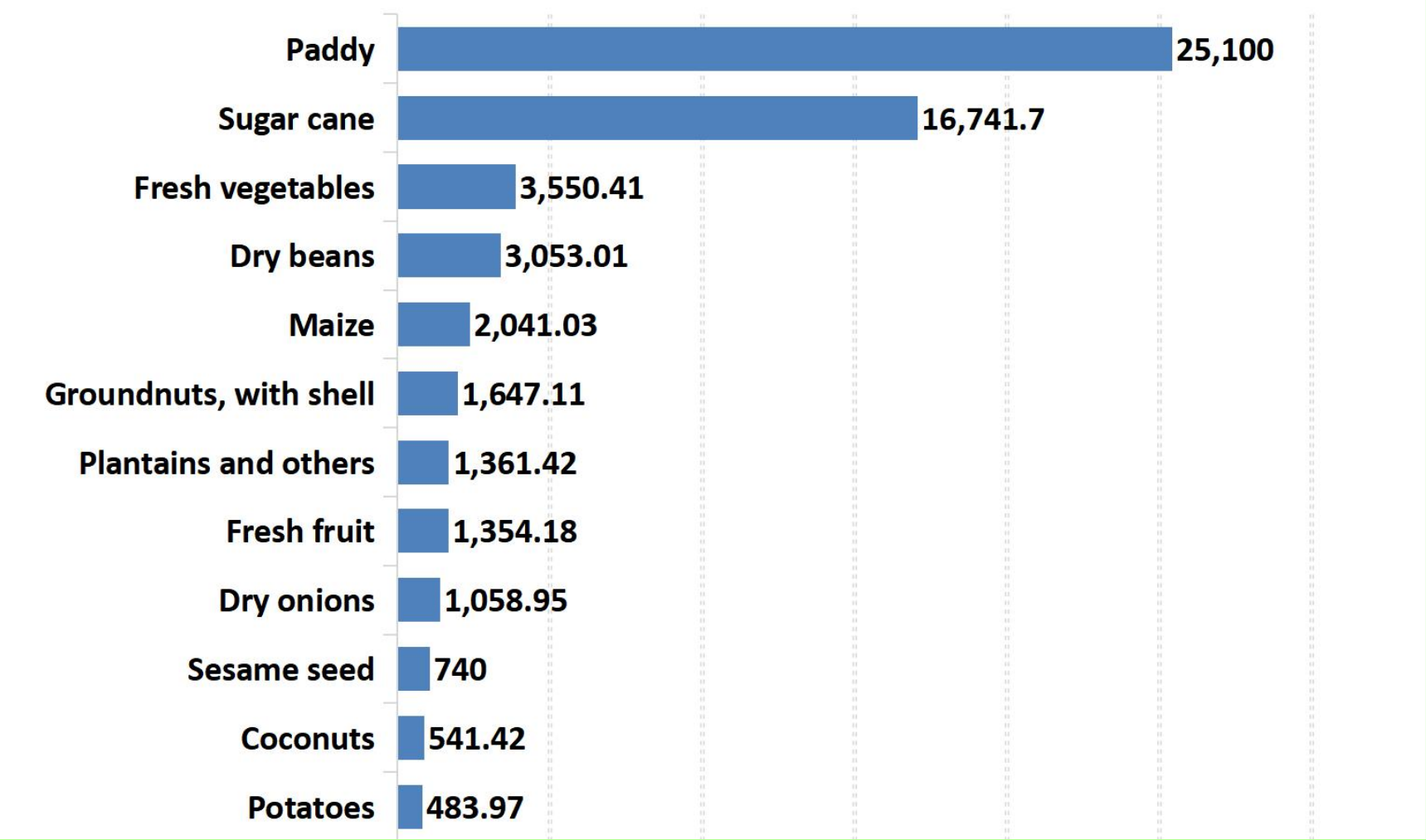
Production volume of main crops in Myanmar in 2020
(in 1,000 metric tons)



(Sources: Production Volume of Main Crops in Myanmar in 2020, Statista 2023/1060675)

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Utilization and Disposal Options of Agri-residues

Ranges of Option	Consequential Effects
Crop residues retention	CH4, termites, pest etc
Stubble burning	CO2, smog, particulate matter, ash etc
Randomly discarded in public place	BOD, COD
Use for domestic cooking fuel	CO2, smog, particulate matter, ash etc
Recycle to produce end products	positive
Renewable energy - torrefied and non-torrefied pellet	**positive**
Direct combustion/gasification/anaerobic digestion	positive
Organic fertilizer	What technology is going to be used ?
Feedstock for animals and fowls	Needs fermentation
Others	Depends

(Sources: SSGE Internal Discussion Paper, Dec 2022)

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VALORIZATION OF AGRI-RESIDUES INTO BIOCOAL

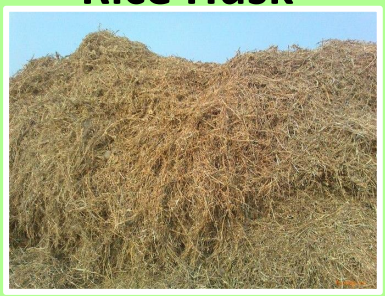
The amount of agriculture residue generated globally is equivalent to about 50 billion tons of oil (Sources: ENEP, 2022)

Valorization of agricultural waste into value added product for sustainable development is in line with SSGE's long-term development plan.

Rice Husk

Peanut Shell

Sesame Straw



Soybean Stems

Corn Stalks

Bagasse

SSGE's BIOCOAL

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Possible to Replace Fossil Fuels

- Global crude oil consumption was 4.25 billion tons in 2021

  (Sources : Google, 2021)

- Global coal consumption was over 8 billion tons in 2022

  (Sources: IEA Latest Annual Market Report on this Sector, 2022)

- Global wood pellet demand outlook was about 45 million tons in 2022

  (Sources: Sources of information extracted from the web-page of GEMCO Energy, Global Wood Pellet Demand Outlook - Global Premium (Heating) Pellet Demand (Residential and Commercial) in 1,000's Metric Tons.)

- Global NG consumption in 2021 was 4.04 trillion cubic meters which were equivalent to about 3.35 billion metric tons

  (Sources : Natural Gas Consumption Worldwide, 1998-2021, Statista)

NB: 4.25 billion tons+8 billion tons+3.35 billion tons = **15.6 billion tons** of fossil fuels could possibly be replaced by agri-based torrefied pellet. This accounted for just over 31% of the 50 billion tons of oil (Sources : SSGE Internal Discussion Paper, May 2022)

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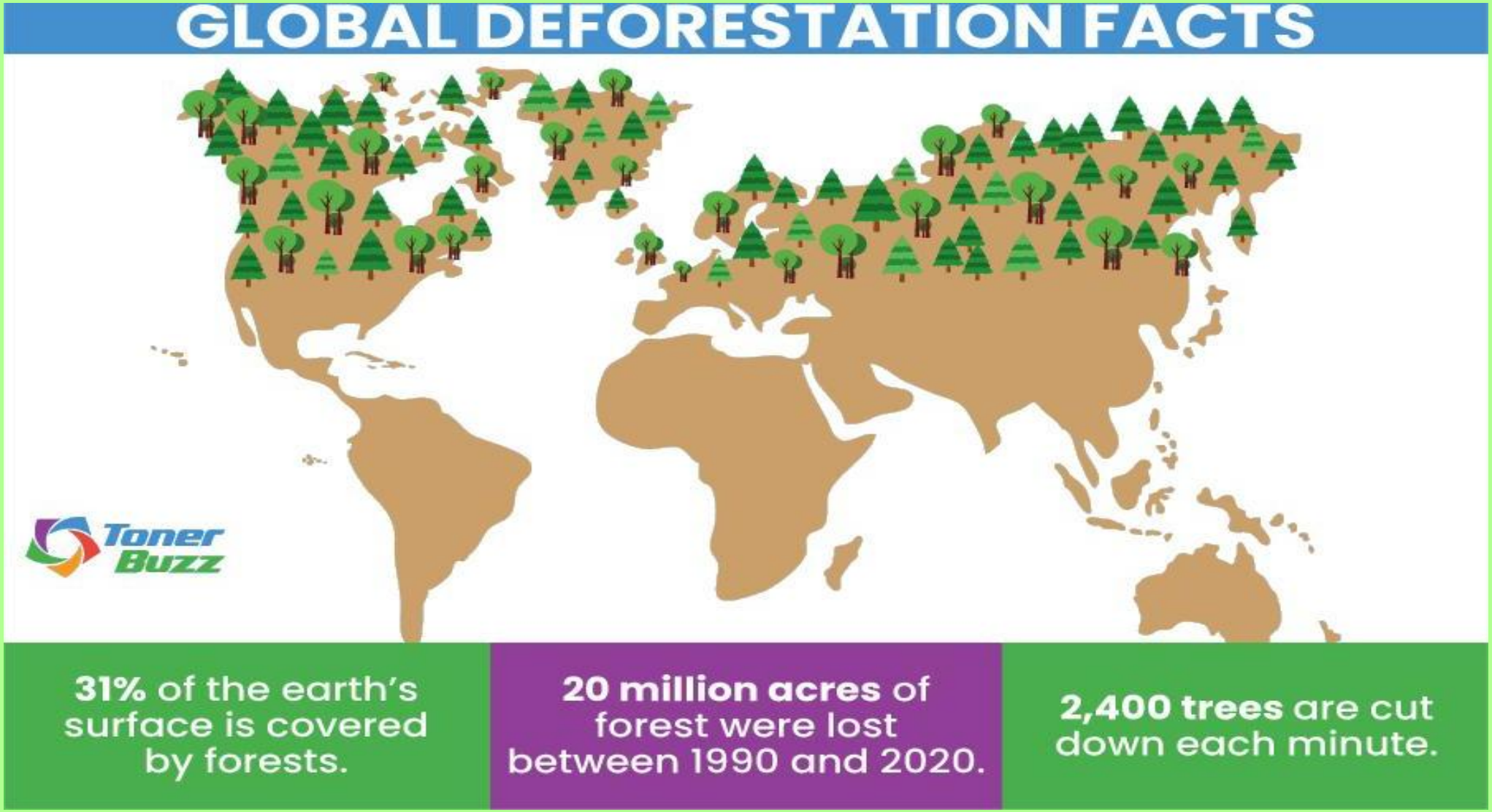
Stopping Deforestation



(Sources of information : Deforestation Facts and Statistics (Global Data), 3/8/2022)

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Improving the Forest Eco-system

Forest ecosystems are areas of the landscape that are dominated by trees and consist of biologically integrated communities of plants, animals and microbes, together with the local soils (substrates) and atmospheres (climates) with which they interact.

(Sources of information : Deforestation Facts and Statistics (Global Data), 3/8/2022)

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Creating a Better Living Planet

Three "R" strategies adopted by SSGE to reduce environmental pollution:

- Reducing stubble burning

- Reducing natural bio-degradation

- Reducing agri-waste discarded randomly in the public place

(Sources : SSGE Discussion Paper - Decarbonization of the Economy, April 2023)

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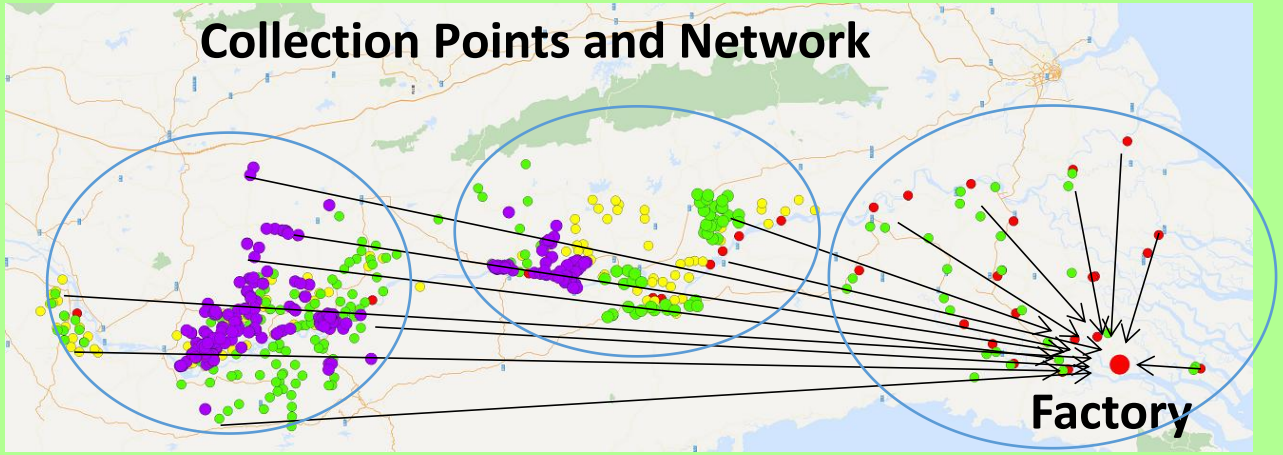
AGRI-RESIDUES COLECTION AND PRE-TREATMENT

- Sophisticated conurbation and agglomeration network developed for collecting agri-residues.



- Multi-logistical channels are employed for agri-residues collection.

Land transportations

Water transporations

- Patented agri-residues treatment technology developed for this biocoal project.

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PRODUCTION FACILITIES

- Patented torrefaction technology developed specifically for processing agri-residues into biocoal.

- Production lines comprise of upstream and downstream equipment.

- 6MW biomass power plant supplies electricity to the whole operations.

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TORREFIED PELLET SPECIFICATIONS

- Main advantages of agri-residues based biocoal highlighted as follows:
  - Hydrophobic

  - Ash content is reduced from 9.2% to below 3%
    (major pretreatment technological breakthrough achieved)
  - High energy density can save up to 40% of the logistical cost.
  - External storage is possible.

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TORREFIED PELLET SPECIFICATIONS(continued)

- ✧ Energy value is 22MJ (5200kcal/kg)
- ✧ Boiler requires no modification.


- ✧ Can either be co-fired or independently combusted.


- ✧ Other advantages are featured in the company's web-page.
- ✧ Other specifications are available from the TNO Report.

(Sources : Combustion Test Report Conducted for SSGE Bio-energy Co Ltd, July 2022)

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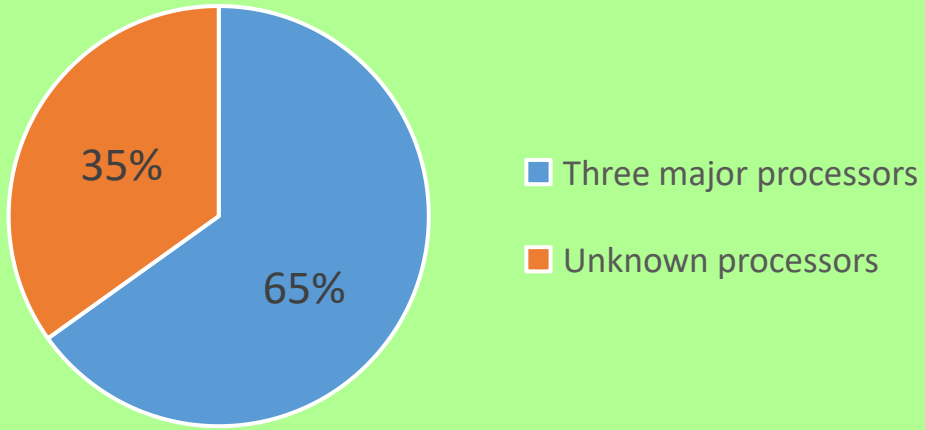
GLOBAL BLACK PELLET MARKET

Global production volume for black pellet is still relatively small when compared with the production volume of wood pellet. The global Black Pellets market was valued at US$ 84 million in 2022 and is projected to reach US$ 204.6 million by 2029, at a CAGR of 13.5% during the forecast period.

Black Pellet Production Volume in 2022

- 65% production volume represented 280,000 tons is dominated by three major processors.
- 35% production volume represented 150,000 tons dominated by other unknown processors.



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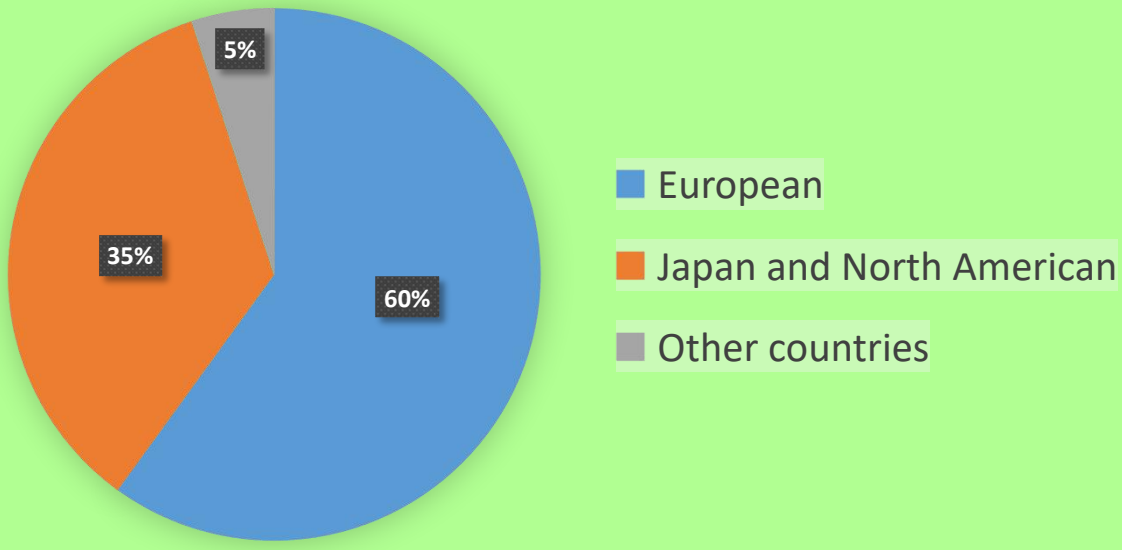
GLOBAL BLACK PELLET MARKET (continued)

Consumption by Major Users in 2022

- 60% consumed by European fossil coal power plants.
- 35% consumed by Japan and North American fossil coal power plants.
- 5% by rest of the world's fossil coal power plants.



Sources : Black Pellet Market Size, Share Global Outlook and Forecast 2023-2029, Chemical Research

TORREFIED PELLET APPLICATION FOR INDUSTRIAL MARKET

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Four market segmentation identified :

- Suitable for coal-fired power plants
- Steel plants
- Cement plants
- Industrial establishments which are using boilers




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NON-TORREFIED PELLET APPLICATION FOR DOMESTIC MARKET

- Agri-biomass pellet is specifically designed and processed for domestic stove application, by its high energy value, low ash content and easy to transport or store.
- Suitable for domestic stoves, self-declaration of conformity document is available upon request.
- Ash content is below 1.5 percent which confirmed by SGS lab-test report.
- A high quality agri-biomass pellet has equivalent characteristics as woody based pellet.

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NON-TORREFIED PELLET APPLICATION FOR DOMESTIC MARKET(continued)

- Unlike woody biomass pellet, agri-biomass pellet discourages deforestation - saving the volatile planet.
- Utilization of agri-residues to produce agri-biomass pellet helps farmers to earn extra income.
- Agri-biomass pellet helps reduce stubble burning and natural degradation when agri-waste is discarded in the open field.
- Agri-biomass pellet is more environmentally friendly than woody-based pellet in terms of cutting the CO2 emission, discouraging deforestation and improving the ecological system

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REVERSING THE CLOSURE OF COAL-FIRED POWER PLANT

- Since biocoal can replace with fossil coal, power plants can continue to operate without facing compulsory closure.

Thermal Power Station

Natural Gas Power Station

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REVERSING THE CLOSURE OF COAL-FIRED POWER PLANT(continued)

- Save substantial capex to build expensive NG fired power plants.
  It costs between US$676,000 to US$2,095,000 to build one MW NG fired power plant,
  while it costs between US$2,934,000 to US$6,599,000 to build one MW coal fired power plant.
  (Sources : Natural Gas Power Plants Are Cheaper to Build by Mayur Sontakke, 17/01/2015, Yahoo Finance)

- Biocoal users should enjoy the benefits of subsidies, carbon credit, cap and trade scheme etc.

- Cheaper energy bills to industrial and domestic users.

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CERTIFICATION DOCUMENTS

The following documents are available upon request:

- RSB Global and EU RED certification.

  SSGE's Biocoal is certified by RSB - Roundtable Sustainable Biomaterials which confirms that our biocoal is fully complied with the global and EU RED standards.

- TNO Combustion Test Report.

  The report concludes that the technical parameters of the biocoal are in line with the general requirements of the power plant operators.

- SGS Lab-test report.

  The analysis report from SGS can be provided upon request.

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TEN REASONS TO SUPPORT RENEWABLE ENERGY

- A real alternative
- They are clean
- Inexhaustible
- Safe
- Available everywhere
- Avoiding geopolitical conflict
- Offsetting economic uncertainties
- Creating wealth and jobs
- They are inexpensive
- Regulatory framework

(Sources of information : Ten Reasons to Support Renewable Energy - Active Sustainability for all. Active Sustainability 020218644894)

FOR FURTHER INFORMATION, PLEASE CONTACT US:

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