Production of Briquettes Energy from Biomass in India – A future prospects

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ABSTRACT

Energy is immense important in economic development of any country, is much depending on the availability of energy. The degree of energy consumption can be used as a parameter to assess the stages of economic development. The shortage of energy poses the greatest hurdles for economic growth. Low level of energy consumption is the clear indication of under development.

Now the demand for energy is unlimited and growing apace. But the question is, whether the country energy resource is adequate to meet the expected demand cannot be answered in definite terms. No one exactly knows about the potential resources of coal, oil or natural gas. Conservation of these conventional sources is an indomitable equation challenging the policy makers and consumers all over the world and there will be an intensive search for new deposits with the help of the new technology.

This paper provided framework for experimentation on this renewable energy source which is still rarely used in the country , and it was widely acknowledged that increasing the use of briquette biomass in the country could not only help diversify India's energy supply, but could also create substantial growth and providing jobs and lowering greenhouse gas emissions. Since the mid-nineteenth century, Briquette use has been linked to periods of fuel shortages and times of crisis. During World War II, briquette production from waste wood and other residues greatly expanded in India through Europe and America. After the War, briquettes lost ground in the market due to cheaper hydrocarbon alternatives. During periods of high energy prices, such as the 1970s and early 1980s, the use of briquettes was Revitalized, Finally, due to movements combating climate change and global promotion of renewable and clean energies, the use of briquettes is spreading nations wide, steadily growing from 2000 until today. This paper reveals that, the spatial distribution of this briquette biomass energy and how to promoting and expanding the use of such environmental-friendly technologies.

Key word:- Briquette, renewable energy, Biomass, log, Agro-waste,

Introduction: The primary sources of energy in India are coal (40%), Oil (22%), Natural gas (8%), Electricity and Thermal power are not available abundantly. Therefore, the problems such as the quality, quantity and uneven distributions of energy resource have created lot of ecological imbalances. Apart from this the use of fossil fuels emit the green house gas, ultimately affects the atmospheric condition. Resulted in global warming, it has caused changes in the world's climate. Therefore, there is a every need for the development and utilization of non-conventional energy

like solar energy, wind power, biogas, biomass, sea waves, sewage water etc., should be developed and utilize in large scale as a substitute to conventional energy. Growing population as a result, its increase in the energy demand, together with growing global Consciousness about the scarcity of the earth's energy resources, has turned energy into a precious so that nowadays international geopolitics are largely associated with access to and control of energy sources. Traditional energy sources are characterized as exhaustible and some of them, especially fossil fuels, have substantial impacts on the natural environment and are the main culprit of climate change. Approximately 70% of biomass energy is consumed in the country for traditional uses in directly with is having very low efficiencies as 10%-20%. As a global solution, The sources of renewable energy that have reached full commercial maturity are: solar, wind, tides and waves, rivers, geothermal energy, organic waste and energy stored in vegetation and forests. Etc.,. play a key and unique role. Since they are obtained from natural, regenerative sources that do not deplete and they also cause minimal to no environmental problems, such as climate change, radioactive waste, acid rain and air pollution.

Briquette biomass energy is the only source of energy for nearly 2.5 billion people nationwide using mainly living in rural areas. Briquette Bio mass energy which originates from forest and agricultural residues can be fabricated into forms such as briquettes or logs, and has the potential to be a viable resource for household heating and cooking. Using briquette biomass energy reduces dependence on highly polluting fossil fuels and also plays a vital role in reducing illegal logging. With the increasing risks of forest fires posed by climate change, establishing a value chain for the sustainable harvesting of forest residues for briquette production also serves to reduce this risk. Finally, the production of briquette biomass energy provides sources of rural income to local communities and generates employment opportunities since manufacturing includes labor intensive tasks such as pruning of trees and collection of biomass material. Biomass briquette production has a significant growth potential both in residential and industrial markets. Its environmental benefits include sustainable forest management, neutral carbon dioxide emissions balance, and low sulphur emissions. Its other advantages include a high calorific fraction, significant moisture content, and lower ash content. In general, briquettes are an ideal fuel for low consumptions where the higher cost of the fuel is balanced out by the lower investment cost of the simplified heating technologies.

briquette is a "densifier biomass fuel made with or without additives, having a cubic, prismatic or cylindrical shape, with a 25 mm diameter or sometimes generally 50-80cm diameter, and 150 mm length sawdust cylinders compressed at a high temperature, with a moisture content ranging between 10 to 20% produced from woody biomass compression or crushed herb." Other shapes, rectangular or prismatic, are also frequent, depending on the manufacturer. In some cases, they have holes in order to improve their combustion. Briquettes may be composed of crushed and densities wood or composed of crushed, dried and molded charcoal, under high pressure. Pellet - It is a type of elongated pelletized fuel, smaller than briquettes, which is manufactured through sawdust pressing.

BRIQUETTE

The typical briquette production process includes the following stages: a) milling, b) drying, and c) pressing (or briquetting). Where lignin serves as a binding agent for granules, therefore there is no need to use any other substance than the wood itself to obtain this product. The pressing process gives the pellets a shiny appearance and makes them denser. Charcoal - Solid residue derived from wood carbonization, distillation, pyrolysis and torrefaction (trunks and branches of trees) and from wood by-products, resulting in a solid, fragile and porous fuel with higher calorific value when compared to wood. For production of 3000 MT per year the unit will require superior, skilled manpower unskilled manpower salesman accountant and office boy. All general functions will be carried out by the promoters the annual cost of manpower works out to Rs.9.06 lakhs.

Objective: This paper reveals that the spatial distribution of briquette biomass energy and how to promoting and expanding the use of such sustainable and environmental-friendly technologies. And improving and adopting sustainable use of forests residues and agricultural waste.

Scope for the study: The briquette biomass energy has scope for economic and environmental benefits, from saving money on fuel, to enhancing the local economy, to cutting down on pollution attributed to fossil fuels and enhancing forest management through the reduction of fire risks and severity. Therefore its field of study is having most important scope and it is not completely explored. Briquette Biomass remains a largely untapped resource. The National Biomass energy Strategy for the Ministry of Energy and Water and the UNDP back in 2020, indicated that the most promising briquette biomass resource for the country is that of sustainably harvested forestry and agricultural residues. The newly published National Renewable Energy Action Plan (NREAP) 2016 – 2020 has set a target of bioenergy for heating at 166.66 ktoe by 2030. For production of briquette biomass can utilize any biological origin material, excluding those that have been embodied in geological formations undergoing a process of mineralization2030),

Production: - Briquette biomass energy use is obtained by converting organic chemical energy into fuels for transportation, heat and/or electricity through five basic processes: combustion, anaerobic digestion, fermentation, gasification and Paralysis, briquette biomass can be converted into heat or electricity. Solid biofuels: Products derived from solid biomass that can be used in direct energy conversion processes, obtained from briquette biomass by generally physical transformations, such as chipping, grinding or drying, as well as densification in the case of briquettes and pellets.

In the particular context of India, where recurrent energy supply challenges need to give way to a substantial promotion of clean energy like Briquette Biomass energy. Consumption of this briquette energy is increases in India during the period of 1990 to 2010 and supply has gradually increased over recent years. The total estimated supply was over 50 EJ, corresponding to about ten percent of the total world primary energy supply (IRENA, 2014). A large majority

of briquette biomass consumption takes Place in residential and commercial premises such as cooking and heating fuel , mainly to poultry farms, restaurants, hotels and safari camps for space and water heating.10 -20% of energy is used from briquette. And on average 36000 mt. of agro-waste will be required to produce 30000Metric tones of per year of briquetted fuel. An average price of briquette is Rs. 2500 per mt. The country officially committed to having 15% of its energy consumption from renewable sources by In order to reach these targets, we must support and monitor all stages of biomass production, ensuring first and foremost that the harvesting of briquette biomass from forestry residues or from agricultural residues is done in a sustainable manner. It is also important to note that harvesting of briquette biomass from forestry residues has the added benefits of reducing fire risks and creating rural employment, and harvesting of briquette biomass from agricultural residues may increase revenues for farmers. We must make sure that the technologies that are set up to transform these residues are up to the required technical and environmental specifications. The Ministry of Energy and Water is committed to focus not only on electricity production from briquette biomass energy, but also on heating as well in order to increase our energy security and provide affordable and sustainable heating options for rural communities is gathering pace and momentum towards achieving a more sustainable energy system. We are moving forward to understand better the national and natural resources, which may be used to satisfy our growing energy needs. Incentives for farmers/herders not to burn crop residue and pastures

Also, it addressed the need to develop preventive silviculture and fuel management aiming at reducing the highly flammable. This includes not limited to grubbing and pruning, tree thinning, brushwood crushing, prescribed burning controlled grazing and species selection. Highlighted the importance of developing an action plan to support small entrepreneurs and small forest enterprises through the development of value chains in wood, in addition to putting in place a sustainable management plan for the development of the socio-economic values

Sources for production of briquette

Firewood Product like small-sized wood or wood that has features that makes it unsuitable for the timber industry. Another typical source of chips comes from treated wood waste sub products such as pallets

Agriculture - Agricultural residues and crops waste such as almonds, hazelnuts, vineyard strains, Pruning olive trees, vineyards and fruit trees are the main sources of solid biomass from agriculture.. Herbaceous agricultural residues are obtained from the harvest of some crops, such as cereals (straw) or corn , Cassava stalk, coconut frond, cotton stalks, corn stalks, straw, millet, oat straw, frond palm oil, rice straw, rye straw, sorghum straw, soybean straw, sugar reed leaves, wheat straw ,Cocoa beans, coconut shells, coffee husks, cotton seed hulls, peanut shells, cobs and wrap corns, oil palm stalks, waste from olive pressing, rice ball, sugar cane bagasse. Again, source availability depends on its seasonality and variation of agricultural production.

PROCESSING OF BRIQUETTE

Forest and agricultural industries' residues - Chips, bark or sawdust, Leaves, branches, stumps, roots from primary and secondary industries processing wood, fruit stones, shells and other food industry residues (olive oil, pumice, canning, nuts...) form a significant share of many industrial solid biofuels. In these cases, their seasonality is due to variations in industrial activity. It must be noted that certain residues or by-products should be treated carefully because they may contain other undesirable materials or substances, such as paint, adhesives, inorganic materials (nails, screws, etc.) which affect the quality and safety of the product obtained and the integrity of the process.

Energy crops - Energy crops are crops specifically formulated for energy use. Among the various agricultural herbaceous species likely to become energy crops are thistle, sorghum and Ethiopian canola, and among tree species, poplars, eucalyptus and paulownia, Acacia, Cunningham lancelet, Eucalyptus, Pinus, Populous, Platens, Robinia pseudo acacia y Salix. These species having lower water demand than poplars produced from woody biomass compression or crushed herb. It is made of combustible material obtained from above said sources like agricultural, forestry waste, or coal dust.

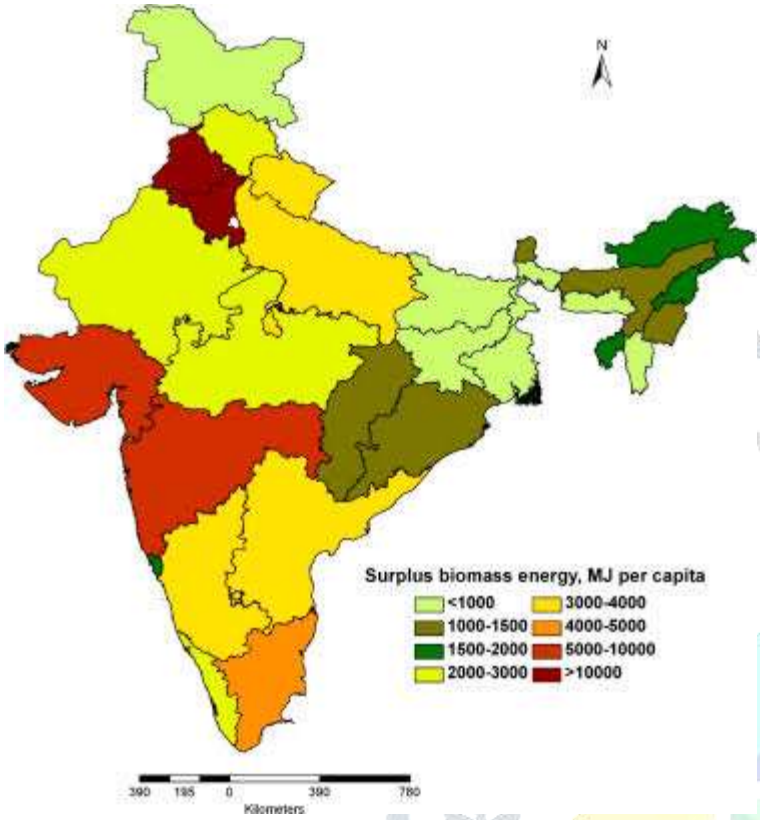
Prices of Various Residues

Residue	Cost per Metric Ton	Quantities in Metric Ton
Sawdust	400-500	225.00
Coffee Husk	450-600	22.50
Bagasse	250-350	31.00
Rice Husk	450-600	65.90
Tamarind Husk	250-350	10.00
Coir pith	300-350	4.50
Ground Nut Shell	450-550	11.10
Cotton Stake	400-450	NA
Stake	400-500	2.00

Sources: statistics department

Distribution: It involves many productive stakeholders and dealers who sell to captive customers. In the country, large manufacturers operating on a regional or even national scale, with centralized production and distribution service and sales points, often produce domestic briquettes. . The briquettes, which are branded "mkaa bora", are made with an Indian-made roller press fed by carbonized agricultural waste that is bought from people with a "cash at the gate" policy and waste to energy policy allowing them to develop a large network of people who provide a continuous supply of raw material. In 2010, the company, with a marketing campaign partly funded by USAID, was selling 120 tons of its pillow shaped briquettes per month The market for industrially manufactured briquettes comprises the public sector, private facilities with mid to large consumption rates above 5 kW thermal, medium-sized commercial and services premises and industries with small and medium energy demands. Industrially made briquettes have higher energy requirements per customer than residential ones. Although non-dandified biomass fuels, e.g. wood chips, or almond shells are cheaper than both types An advantage of industrial briquettes over domestic ones is the quality of its properties, especially physical stability and calorific value, which are essential to medium-low energy-requiring facilities. The development of this market is crucial for future innovation, modernization and automation of briquette production and consumption. India exported biomass briquette worth USD 123984.91 every year and it expected and plans to increase3 exports 10billion USD by 2027 and in India there is a great demand for briquette energy about 70 biomass briquette machines

were installed by 1995 by 2017 the no. is 3750. of briquettes machine installed to 250 every machine cost of 4lakhs Preheating causes are due ….. in power consumption (15-20%) which is highly beneficial in terms of economies.3500 Million tons of wood equivalent 8960 millions barely of fuel equivalent and annual sustainable yield of 105 million TWE and used 35.66 million TWE. Sold values of briquette is 1200 to 1500 per ton every industries having Production rate is 48-540 kg/hr.



Biomass briquette is also called white coal in the fuel Industry production and consumption has a significant growth potential for medium and small installations, both in residential and industrial markets. Furthermore, it would create new employment opportunities and income generation, especially in rural areas. The competitiveness of briquettes in the biofuels market is linked to several parameters, namely, the development of renewable energy in the global market and specifically of biomass compared to fossil fuels and estimated production of 20 tons per day per machine.

Techno Eco of Briquette Production

The average capacity utilization of Briquette Machineries is low at about 28%, however the crushing cost of procurement cost (Rs per ton) of Briquettes production

Manufacturer	Raw Material	Frame person	Power and Labor	Maintenance	Repair
A	400	75	400	200	50
B	400	100	250	25	75
C	350	75	300	150	20
D	500	100	200	100	50
E	400	100	300	150	100
F	400	200	200	100	100
G	300	100	270	80	100

The break even period for the project shall be around 9 months. Every year millions of tons of agricultural waste and forest waste are generated these are either none used or burnt inefficiently in their loose form causing air pollution. Handling and transportation of these materials is difficult due to their low bulk density. Their waste can provide renewable source of energy by converting into high density fuel briquettes without addition of any blinder. The demand of energy is increasing day by day and the supplies of sources are limited. The briquette energy project is ideals because availability of huge agro-based and forestry wastes in India and it is very good in for agricultural based area and industrial based Maharashtra, west Bengal Orissa, Jammu and Kashmir Tamilnadu, Andrapradesh, Karnataka in India

Planning and development: The government is offering special incentives for implementing biomass briquette plant project Major highlights of the scheme. It is giving 100% income tax free for the first five years. 35% of subsidy on the cost of briquette plant is provided by government. No requirement of NOC from state pollution boards and 80% depreciation on capital cost in the first years. There is how the companies are getting benefits and profits with project. Banks and several other financial organizations are providing loan facilities to make maximum no. of applicants for subsidy for biomass plant project in India people can provide superior quality biomass briquette machine as demanded. Sri Ram Agrotech (Rajkot) that intend and design briquette forming machine on the basis of international quality and safety standards. The preparation of international standards is usually done through ISO technical committees. ISO standards' contents are copyrighted, and national certification bodies typically adopt ISO standards into their national standards and regulations. An ISO regulation that is directly related to biomass briquettes is Regulation ISO 17225.27REGULATION ISO 17225, Solid biofuels. Specifications and types of fuels like briquette. Their advantages are described below:

Environmental benefits:- Using renewable energies can contribute to sustainable forest management.• Neutral CO2 emissions balance • Low sulfur emissions (which usually causes acid rain).• If it has a forest origin under a proper management scheme, it contributes to forest regeneration and prevention of forest fires. If it is sourced from agricultural or industrial waste, it enables a residue with a second life. Ash from briquettes burning can be used as fertilizer.

Social benefits: - Creates jobs throughout the supply chain, especially in rural areas, thus preventing rural migration to urban areas.

Sl. No.	Employees	Monthly salary	No. Of employees	value Rs. In lacs
1.	Unskilled man power	10000	10	120000
2.	Supervisor	30000	01	320000
3.	3.skilled man power	15000	06	160000
4.	Salesman	20000	02	240000
5.	Accountent	20000	02	240000
6.	Officeboy	4000	01	48000

If it has a forest origin, it will promote its sustainable management, improving the state of Forests, with direct incidence to the decreased risk of fire and the corresponding damages to human health and properties. It is also having benefit of indirect incidence in perception of the forest as a source of jobs and wealth creation e.g. tourism. It promotes confidence in renewable energy at local and rural levels.

Economic benefits:-

• Positive life cycle economic balance, cost €/kWh lower than fossil fuels. Most of manufacturing industries like leather Brick, Textile etc., are benefited from briquette. Use of briquette helps to decreases the dependence on energy imports, thus favoring greater energy price stability by not depending on international markets volatility. The b below table shows that the potential uses of briquettes instead of coal.

Potential uses of Briquettes

District	Type of Industry	Replacement of Coal
	Leather, Brick	Coal
	Solvent extraction of mills. Brick	Coal
	Textile, Dye and Chemical Industries	Wood Beat
	Tea Factories, Rubber, pharmaceutical	Coal
	Textile, Brick, Pharmacies	Coal

Source: UNDP-CEDRO, http://www.cedro-undp.org

Economic benefits are local added value, fostering local or regional businesses along the supply chain like forest operators, ware housing, briquette manufacturers, dealers, installers and maintenance service provider.

The below table shows that the transporting cost per ton for transporting various raw materials to the factory.

Transportation Cost Rs/ Ton

Raw Material	0.01-10Km	10-30 Km	100-200 Km	> 200 Km
Saw Dust	750	1000	1500	2000
Ground Nut Shell	750	1000	1500	2000
Cotton Stalk	750	1000	1750	2000
Mustard Stalk	750	1000	1750	2000
Coffee Husk	1000	1750	2000	2500
Coir Pith	1000	1752	1000	2500
Rice Husk	1000	1750	1500	2500
Bagasse	1000	1500	1500	2000

Source: UNDP-CEDRO, http://www.cedro-undp.org

The below table shows that the ability of briquettes' competitiveness compared to other solid biofuels with High calorific fraction, Moisture content, density and constant and homogeneous granulometry The calorific value is the amount of thermal energy in the combustion of one kilogram of fuel. Calorific value can be given as Lower Calorific Value or Lower Heating Value (LHV) or as Higher Calorific Value or High Heating Value (HHV).

Cost of Thermal Energy for various fuels

Fuel	Cost Rs/Kg	Calorific Value Rs/Kg	Efficiency %	Energy Cost
Leco	1.50	17556.00	60.00	150.00
Ferwood	2.50	26125.00	60.00	120.00
Briquettes	0.90	12540.00	60.00	115.00
LPG	1.30	18810.00	60.00	245.00
Furnace oil/ LDO	6.50	48664.00	55.00	111.00
Producer gas , briquettes	6.00	43639.00	95.00	113.00
Coal	10.50	4506.00	60.00	142.00

Source: UNDP-CEDRO, http://www.cedro-undp.org

Problems: - Potentially higher price conditioned by the manufacturing (compaction) process and the availability of other cheaper biofuels closer to the customer premises and Technical description. The storage area must be covered and with sufficient capacity to enable the continuous operation of the installation during the periods of lower supply of raw material covering the piles of raw material with a geotextile is also a possibility, often cheaper than building sheds. It is also important to store the raw material on cemented floors, especially outdoors, to prevent the mixing of sand, stones or other impurities that can both affect the briquetting machinery as well as the quality of briquettes. In order to ensure that the moisture content of the raw material is reduced to the required levels for compressing, drying machines are often considered to complement the natural drying achieved during the storage period. Ash control and treatment is necessary. Electrostatic precipitators can reach an emission reduction above 90%. Seasonal requirement, availability of capital is very less, only few industries are using briquette, availability of expertise in machine manufacturer are very few and promoters are not working satisfactorily.

Conclusion: . To this end, I hope that this paper will serve the purpose of further promoting the sustainable harvest and use of biomass from forestry and agricultural residues such that our forests are further protected from risks of fires and in order to increase local sources of employment and revenue. It aims to provide clear and unambiguous classification principles for solid briquette fuels, as a tool to enable efficient trading, transparency between selling and buying parties, and to facilitate communication with equipment manufacturers.

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