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An Empirical Study on Sugarcane Linked Electricity Generation in India with Special Emphasis on Rural Agricultural Marketing

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I. INTRODUCTION OF SUGAR CANE LINKED ELECTRICITY

The sugar industry plays an increasingly important role globally, with Countries such as Brazil and India dominating the sector. However, this poses environmental problems, as the industry generates large amounts of waste, such as bagasse. This by-product, partially powered up in sugar refineries and in the pulp and paper industry, could make a significant contribution to the overall use of biomass energy, if the disadvantages normally involves low density and high moisture products is overcome. From this perspective, heat conversion technologies, especially roasting, are believed to be able to improve the fuel properties of this material, making it more attractive for export and potential use of in remote destinations. In this work, sugarcane samples were collected and simulated the process of obtaining bagasse. Then, bagasse was dried and heat treated at 200 and 300 °C to simulate over-roasting and drying. . Then, product characterization was performed, including thermo gravimetric analysis, elemental analysis, calorimetric and energy concentration.

The results showed significant improvements in function. The amount of energy, from 18.17 to 33.36 MJ kg⁻¹, bagasse is dried into bagasse roasted at 300 °C, showing that despite the large volume loss, the still has potential for a price chain future value for this form of waste, as increased energy density could promote its transport and use at locations far from the place of production.

Sugarcane belongs to a small group of major agricultural crops that, along with cotton, soybeans, maize, wheat and rice, occupy millions of hectares of land [1–3]. In addition to the countries of origin of the species, the main producers are Southeast Asian countries, particularly the Philippines, Thailand, India and Brazil, which have already assumed world dominance in terms of the area reserved for species separately for production and yield per hectare achieved. . In fact, according to the information supplied in 2020 by the Food and Agriculture Organization of the United Nations (FAO), currently has annual production of 1.89 billion tons, occupies a production area of 27,000,000 hectares, spread over more than 100 countries. As can be seen in Table 1, the world's 20 largest producers represent with an output of 1.75 billion tons per year on an area of approximately 2, 250,000 hectares, completely dominating the industries with 93% of the output. in the world in 91% of the total sugarcane area occupied. In addition to being a food crop, sugarcane can also be considered an energy crop, since ethanol is produced from sugar. In this regard, Brazil is considered a pioneer, mainly because of the developments made since the 1970s following the oil crisis. Supplied in 2020 in the Food and Agriculture Organization of the United Nations (FAO) currently has annual production of 1.89 million tons occupies a production area of 27000000 hectares spread over more than 100 countries . As see the world's 20 largest producers represent with an output of 1.75 million tons per year on an area of approximately 250000 hectares completely dominating the industries with 93% of the output. In the world in 91% of the total sugarcane area occupied. In addition to a food crop sugarcane can also considered an energy crop since ethanol is produced from sugar. In this regard Brazil is considered a pioneer mainly because of the developments made since the 1970s following the oil crisis.

II. BAGASSE AS A GAME CHANGER

From this agricultural manufacturing, further to the principle cloth, sugar, there are some via way of means of-merchandise which are of hobby for recovery. Of these, sugarcane bagasse stands proud as a product with robust capability for electricity recovery, seeing that it's miles a renewable organic cloth that, if properly processed and densified, may be used an opportunity supply of carbon-impartial renewable electricity. Sugarcane bagasse is normally used for the technology of steam in sugar flowers and with inside the distillation of alcohol. In Brazil in the course of the 1970s, Pro-Alcohol became the primary predominant application to update fossil gasoline with a renewable

gasoline, hydrated ethanol. . At that time, bagasse became taken into consideration waste, and comparable to any waste, it became vital to discard it . Burning or incineration in a boiler became a method to dispose this waste, producing a part of the electricity fed on at manufacturing flowers. Thus, over the years, bagasse has long gone from a waste product to a applicable supply of electricity, and with every passing day, its significance will increase proportionally to the evolution of electricity expenses with inside the global market. Thus, this spinoff is now not taken into consideration a waste product and has come to be a vital kind of electricity input. Sugarcane bagasse offers tremendous capability for the manufacturing of derived fuels using gasification, fast pyrolysis, or hydrolysis accompanied via way of means of fermentation [40]. For similarly development of those technologies, unique understanding of the bodily and chemical traits of sugarcane bagasse is vital. This paintings ambitions to signify the usage of sugarcane bagasse for power era in a manner that permits each its garage and the opportunity of exporting it as an power product due to the power densification system the usage of a thermochemical conversion system. To perform this paintings, a bibliographical evaluation of the processing of sugarcane bagasse turned into organized whilst the sugarcane samples have been acquired, which have been characterised and subjected to the thermochemical conversion system of torrefaction as a manner to reap protection for lengthy durations of time, permitting safer garage without organic hobby and turning into hydrophobic. These new thermally handled and power densified merchandise may be transported, offsetting the logistical issues related to high transportation costs. As a result, the principle parameters for the usage of sugarcane bagasse as a power supply have been identified. This evaluation and analytical examine brings collectively records acquired with the aid of using previous studies works so that you can gift and consolidate critical records associated with the bodily and chemical characterization of sugarcane bagasse for power purposes, in addition to evaluate the results acquired with the aid of using the characterization, so as to signify every other choice for developing a capacity cost chain for the power recuperation of this product.

Sugar yield Graph

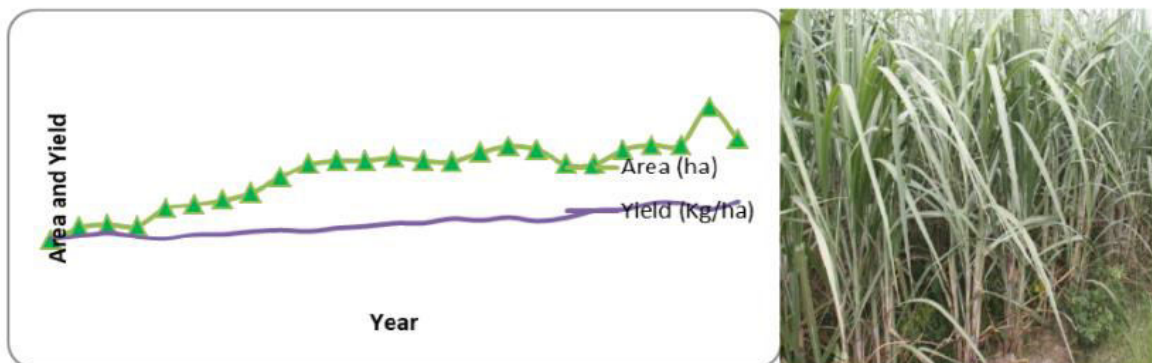
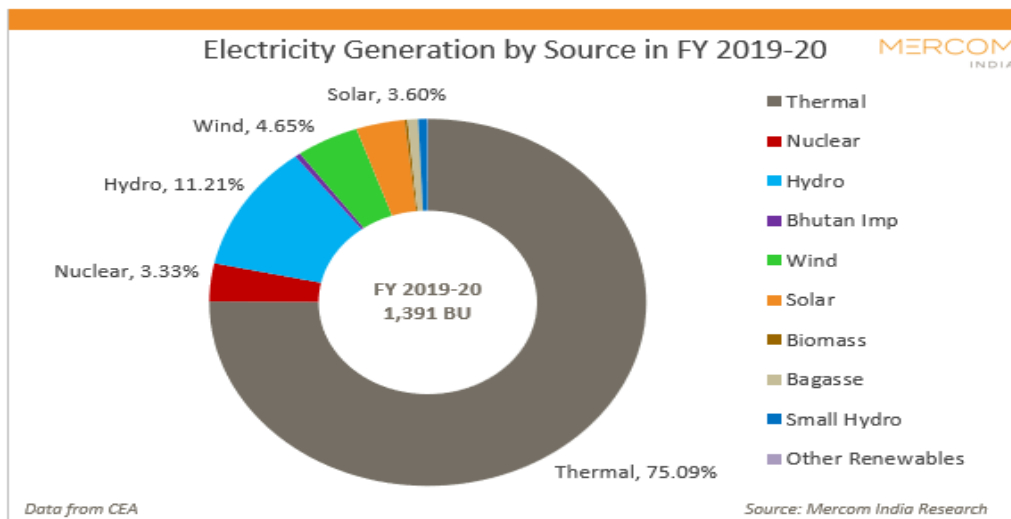


Figure 1 Trend line showing sugarcane area and yield from 1991-2015



This graph says about electricity Generated by sugarcane (Bagasse).



III. RAW MATERIALS

Sugarcane bagasse is the stable residue produced in sugar turbines after the extraction of juice, and over the years, it has turned out to be a crucial power input. Thus, it's far vital to realize its traits with a purpose to use it successfully with ok drying overall performance for the technology of steam, pyrolysis, or gasification, or for hydrolysis. Sugarcane, has been acknowledged due to the fact 8000 BC and is one in all six species of the genus *Saccharum*, that is a collection of tall grasses from Southeast Asia. The stems are the components from which sugar juice and bagasse are produced. However, leaves and different components also can play a crucial function with inside the technology of power, specially in co-technology systems, as defined with the aid of using sugar cane. The composition of sugarcane is about 86 to 92% juice and eight to 14% fibrous material. . This relies upon now no longer best at the composition of stems, however additionally on different elements, along with the plant variety, variety of tips and leaves, maturation, harvesting period, whether or not it turned into burned or now no longer earlier than harvesting, whether or not the harvest turned into mechanized or manual, and climatic elements along with whether or not it rained or now no longer during the plant boom period. Physical and chemical traits of sugarcane bagasse have a direct impact on its use as a power source. The usually used approach is bagasse combustion in steam generators, and know-how of bagasse traits is vital for the layout of steam technology equipment.

Sugarcane bagasse is a complicated aggregate of cellulose, hemicellulose, and lignin, which make up the cells of the partitions in vascular bundles. The quantity of fiber within the stems relies upon at the length and diameter of the stems. The quantity of nodes and the space among nodes impact the quantity of fiber acquired within the extraction. Cellulose is a high-molecular-weight polymer composed in large part of glucose gadgets. Hemicellulose is basically composed of xylose gadgets with small elements of arabinose, both with 5 carbons within the molecular structure (pentose), in place of glucose, which has six carbons in its molecular structure (hexose). Lignin is a complicated substance composed in large part of fragrant phenolic compounds that usually deliver the sugarcane fiber its stiffness. The relative quantities of those compounds rely upon the style of the cane, the age, and the dimensions of the stems. There are also small quantities of inorganic compounds, including calcium and silica, gift within the mobile structures, however those do now no longer have a enormous impact on the general fiber composition. Ash is an inorganic compound observed within the bagasse structure, and its composition relies upon at the plant species, soil, sort of fertilization, and inorganic substances dragged throughout harvesting, which may be mechanized or manual. The most important factors are silica, potassium, calcium, phosphorus, magnesium, and other inorganics.

IV. SCOPE AND FUTURE DEVELOPMENTS

The sugarcane enterprise provides environmental troubles, because it generates huge quantities of waste which can be typically valued energetically in sugar mills. However, boom within the enterprise has additionally brought about multiplied manufacturing of waste, making it not possible to discharge the portions generated. These residues have the ability to be exported for electricity recuperation in different areas, particularly in Europe, wherein the call for and intake of biomass for electricity has assumed unique importance. However, the low density of the material, related to different troubles not unusual place to biomass such as fermentation of the product, make export very hard and costly. The opportunity of the usage of thermochemical conversion technology inclusive of torrefaction to improve the strength ability of sugarcane bagasse affords itself as an extraordinarily promising alternative, as confirmed through the effects received within the checks performed. The advanced active properties related to strength densification make heat-dealt with sugarcane bagasse an asset to the strength market, especially concerning the substitute of coal within the large-scale technology of strength. Further research are nevertheless needed, specially to outline the choicest temperature for use in torrefaction, due to the fact excessive mass loss can avoid the financial viability of projects, through using, for example, a reaction floor methodology (RSM), which explores the relationships among numerous explanatory variables and one or greater reaction variables. It is likewise vital to perform new exams with a bigger variety of samples, in order that the consequences may be statistically validated, due to the fact within the gift look at, it became now no longer possible to perform a statistical look at of the consequences, because, as formerly mentioned, the exams had been only carried out in triplicate. An evaluation of the deliver chain factors, particularly the ones associated with transport expenses and load conditioning in long-distance transport, much like what already takes place with wood pellet deliver chains, ought to be executed as well. Associated with this issue, there's additionally a want to perform research at the capacity for mechanical densification via the manufacturing of pellets or briquettes of the ensuing terrified material.



Recommendations

1. Sugar is a non-perishable good, so the government can store it in warehouses before shipping it to other nations and set the best price for the consumer.
2. Bill settlement for farmers appears to be a serious concern in the research area, banking institutions should develop a receipt financing product to protect sugarcane growers.
3. Converting total bagasse into electricity production will be the best source for the use of sugar cane.
4. Using the other sugarcane pulp or waste as bio waste and using that for electricity consumption will also be better.

V. CONCLUSION

The simplest and most optimal configuration for designing a biomass generator at the sugar factory is when using three generators and connecting them to the PLN grid. The electricity yield at the sugar factory within one year is 7,065,600 kWh produced by generator 1, 5,652,480 kWh produced by generator 2, and 5,652,480 kWh produced by generator 3. Thus the sugar factory can meet the electricity needs independently. The electricity generated by the biomass generator is nineteen, 015,288 kWh in 1 year. The potential of sugarcane biomass has met the needs of electricity, while the community uses the remaining biomass within the sugar factory as a cloth for creating bricks and bio briquettes.



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