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ScienceDirect

Procedia Environmental Sciences 35 (2016) 847 – 852

Procedia Environmental Sciences

International Conference on Solid Waste Management, 5IconSWM 2015

Opportunities for Bio Fuels - Indian Scenario

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Abstract

Sustainable biomass resource has been receiving much attention worldwide due to the depletion of raw material for fossil fuels. However, for proper and optimal exploitation of the available biomass, there is a need to quantify the district-wise availability of biomass in our Country and to prepare a zone-wise recommendation for adopting appropriate technologies for converting the biomass into biofuels.

Earlier in 2007-08, TIFAC had carried out an in-depth nationwide survey on biomass generation, consumption, costing patterns and surplus availability from select agro & forest residues. Subsequently, a 'Centre for Biofuels' has been set up at National Institute for Interdisciplinary Science & Technology (NIIST), Thiruvananthapuram towards undertaking cutting edge research activities in bio-refinery related technologies. Six biomass feedstock were identified for their abundant availability in India. The Lignocellulosic (LC) ethanol pilot plant with a biomass processing capacity of 80 kg/ day has been completed, wherein the first phase focused on detailed laboratory scale studies for select Indian biomass. The second phase would primarily deal with the validation of laboratory scale data at pilot plant for techno-economic analysis of LC ethanol.

TIFAC has recently taken up the task of mapping the current biomass availability and also to assess the technologies for their conversion to biofuel before coming up with zone-wise recommendations. TIFAC would source inputs from both secondary as well as primary research including those from GIS and remote sensing. Automated updation of biomass availability based on current data is also being planned. The paper presents TIFAC initiatives in the biofuel sector – past and present besides recapitulating the technology trend in biofuels sector.

Peer-review under responsibility of the organizing committee of 5IconSWM 2015

Keywords: Biomass, biofuels, agro-residues, value-added chemicals, lignocellulosic ethanol);

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Peer-review under responsibility of the organizing committee of 5IconSWM 2015
doi:10.1016/j.proenv.2016.07.101

1. Sources of Biomass

Biomass, fourth largest source of energy following coal, oil and natural gas (SLU, 2009) is derived from plants or plants based materials, mainly composed of mixture of C, H, O, N and alkali, alkaline earth and heavy metals in traces. It is categorized as agricultural residues, obtained from agriculture harvesting & processing; energy crops, high yielding variety of crops specially grown for energy applications; food & industrial waste, preparation and processing and post-consumer waste obtained from food, drink manufacturer, industrial processes etc. BEC, a (n.d); forest residues obtained from dead wood, logging residues, very small trees, underutilized wood etc. Walker,2010 (as cited in Bajpai, 2013) Biomass has always been considered as an important renewable resource for generation of energy (Forsberg, 2000). However, so far, traditionally a large quantity of biomass especially in rural India has been used in a very inefficient manner either for cooking purpose in the domestic sector (Chaturvedi, 1998) or in small commercial establishments. Even though the energy scenario indicates a growing dependence on conventional forms of energy, for overall socio-economic development in the country and larger utilization of non-fossil based fuel, biomass-based energy solutions are critical.

As there are wide varieties of biomass types, there exist several technological options too for converting biomass into bioenergy. The major conversion technologies include thermal & biochemical, which may release energy directly in the form of heat or electricity, or it may convert into combustible gas or liquid fuel BEC, b (,n.d.). Production of bioenergy also offers a solution to waste management as well as there exists opportunity for production of a wide array of chemicals from biomass. This paper provides an overview of estimates on the production of biomass residues and its usage patterns.

2. Biomass Data Collection and Methodology

Considering the importance of biomass as a sustainable and reliable source for producing energy it was felt important to carry out its assessment. With this in view, detailed information on biomass availability in India from different agricultural sources, its assessment, consumption, availability & costing patterns was assessed by TIFAC through its earlier study report titled '*Availability of Indian biomass resources for exploitation*'. The study was based on primary & secondary research. The primary research was carried out by identifying and selecting districts in various states and identifying relevant government, non-government organizations and private sectors including user groups and industries etc. For secondary research purpose, various Government of India publications, information available through website, research institutes & their articles, etc. were referred. Based on secondary data research, the state-wise and country level crop- production data for all the identified crops had been collected. The primary research included qualitative and quantitative survey. The survey questionnaire was sent to subject experts, local government offices, farmers, farmer-cooperatives, user industries, NGO who are active in rural areas, government departments, mandis, etc. Under qualitative survey, to get first hand information, target groups were either directly contacted or well-structured interviews were organized among the farmers growing one or more crops. Around 700 interviews were conducted across the country to capture all the regional nuances. The production and availability of crops, type of biomass residues generated from each crop national estimates and statewise, forest and aquatic resource were covered under the study.

The surplus biomass availability was assessed based on the quantity of biomass crops produced, its residues generated, the existing usage patterns and practices in that particular region. Generation, consumption & surplus density of biomass was calculated based on per sq. km availability in major states. Top five states producing crops selected under the study were shortlisted based on the secondary research. Within each state, the top three crop producing districts were shortlisted. Within each district a few villages were chosen for survey. The states covered under the study included Andhra Pradesh, Assam, Chattisgarh, Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Tamil Nadu, Uttarakhand, Uttar Pradesh, West Bengal, etc. Vegetables, fruits and plantation crops were however not covered, as their volumes are low relative to food grain crops.