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BICOM – Model for evaluation of locally available biomass competitiveness for decentralized space heating in villages and small towns

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Biomass can play significant role in substituting fossil fuels for space heating and hot water preparation on local level. The Czech Republic is the example of country where solid fuels, namely domestic brown coal, is still massively utilized for this purpose, esp. in smaller towns and villages. Locally available biomass is one of the options how to substitute fossil fuels and to reduce local air pollution. Local sources of biomass consist of: Residuals from forestry, residuals from conventional crop (straw) and intentionally planted biomass on agricultural land. Assuming reality of small towns or villages one should assume that high majority of premises (mainly family houses) is heated from local/individual boilers. This requires transformation of biomass into suitable form – pellets and briquettes. Competitiveness of biomass used for space heating here depends on: (1) availability of biomass in given area, (2) cost of biomass obtaining (e.g. cost of energy crop production), (3) cost of biomass processing and logistic, (4) cost of conventional fossil fuels (namely coal). Paper presents methodology (and case example for the Czech Republic) of BICOM - BIomass COmpetitiveness Model. Model consist of following modules: (1) identification of biomass potential in given area using GIS modeling (based on climate and soil condition), (2) modeling of biomass price (using methodology of minimum price from the point of producer' view and evaluating opportunity cost of conventional agriculture production), (3) modeling of biomass processing and logistics, (4) modeling economic competitiveness of biomass utilization with the coal (assuming needed substitution of heating devices).

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A green technology approach for boosting of saccharification and ethanol efficiency of sugarcane tops

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The world's concern over its energy crisis and reliance on non-renewable fossil fuels has made us focus our attention towards renewable energy sources so as to replace oil usage. Use of first generation biofuels using food crops such as corn and sugarcane has many consequences from increase in food prices to loss in huge amount of water during production of biofuels. Due to these problems, second generation biofuels are most sought that makes use of lignocellulosic biomass due to its abundance, low cost, non-competitiveness with food and diminution in greenhouse gas emissions. Agro and forest residues are potent feedstock for bioethanol since they are generated in large quantity annually. India being the second largest producer of sugarcane (production of 350.02 MT in 2013-14) generates huge amount of sugarcane tops that are rich in carbohydrate content and are usually burnt in the field or used as low quality roughage. One of the major challenges in bioethanol production is the development of an efficient pretreatment method for the removal of recalcitrant lignin in order to unbind the celluloses and hemicelluloses for efficient saccharification follwed by fermentation. In the present study, laccase from *Pleurotus djamor* and cellulase produced from *Trichoderma reesei* RUT C30 was used for pretreatment and saccharification respectively. Under optimal conditions, 79.02% delignification and 504 mg of reducing sugar per gram of pretreated substrate was obtained. Simultaneous saccharification and fermentation using *Saccharomyces cerevisiae* was also conducted which demonstrated significant ethanol production indicating its potential for second generation bioethanol.

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