



2ND BBEST

Brazilian BioEnergy Science and
Technology Conference

20-24 October, 2014

Indicators for sustainability assessment of sugarcane production system in São Paulo State: An environmental approach

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Key-words: sustainability assessment, agricultural production system, sugarcane, sustainability indicators

The cultivation of sugarcane is the third largest in land area in Brazil, mainly because it represents an alternative and renewable source of energy. The most prominent producing region is the South-Central-Southeast with more than 80% of production and the largest national producer is São Paulo state with approximately 54% of this production. The sugarcane production system is complex: the production plants depend on sugarcane growers and capital goods. The products alcohol, sugar and energy are distributed to fuel and electricity distributors, food industry, wholesale and retail, trading and exporting. The environmental and social equity concerns have been strengthened in recent years, especially due to market globalization. Due to the society awareness that has emerged from the new global posture, the need for adjustment of agricultural activities or agro-industrial processes arises for the entire production system aiming to generate positive impact for the environment and society. This article aims to present environmental indicators for assessing the sustainability of sugarcane production system in São Paulo State. These have been validated through remote consultations and face-to-face with stakeholders and experts in this subject. In total 248 experts were contacted and 61% returned with answers and contributions. This consultation was formulated according Delphi Technique and improved the accuracy of indicators making them a useful and effective decision-making support tool. For the analysis of these questionnaires, indicators and their sustainability thresholds were considered validated when the acceptance, by those experts, exceeded 60% of acceptance. This article presents 10 indicators to assess the sustainability of sugarcane production system in São Paulo State focusing the environmental approach. The proposed indicators address some critical points regarding the sugarcane production system in accordance with the recommendation of specialists, among them: effects on physical variables (soil, air and water resources), disposal of waste on the environment, as well as management measures needed. The complexity of the whole sugarcane production system in São Paulo state, as well as of the sustainability assessments, enables indicators and thresholds developed specifically with this approach become important allies in the decision-making process. Thus, the analysis of sugarcane production systems in São Paulo state and the parallelism with the needs for better cultivation process can be the key to understand eminent innovations to the sector as well as to define instruments to support the farmers effectively.