## HISTORICAL CARBON BUDGET OF THE BRAZILIAN ETHANOL PROGRAM

## Sergio Pacca<sup>a</sup>, José R. Moreira<sup>b\*</sup>

<sup>a</sup>Environmental Management Progrom, School of Arts, Science and Humanities, University of São Paula, Brazil <sup>b</sup>Institute of Electratechnology and Energy, University of São Paula, Brazil

This work models the carbon neutralization capacity of Brazil's ethanol program since 1975. In addition to biofuel, we also assessed the mitigation potential of other energy products, such as, bioelectricity, and  $CO_2$  emissions captured during fermentation of sugar cane's juice. Finally, we projected the neutralization capacity of sugar cane's bio-energy system over the next 32 years. The balance between several carbon stocks and flows was considered in the model, including the effects of land-use change. Our results show that the neutralization of the carbon released due to land-use change was attained only in 1992, and the maximum mitigation potential of the sugar cane sector was 128 tonnes of  $CO_2$  per ha in 2006, An ideal reconstitution of the deployment of the sugar cane sector, including the full exploitation of bio-electricity's potential, plus the capture of  $CO_2$  released during fermentation, shows that the neutralization of land-use change emissions would have been achieved in 1988, and its mitigation potential would have been 390 t $CO_2$ /ha, Finally, forecasts of the sector up to 2039 shows that the mitigation potential in 2039 corresponds to 836 t $CO_2$ /ha, which corresponds to 5.51 kg of  $CO_2$  per liter of ethanol produced, or 55% above the negative emission level.

<sup>\*</sup>Corresponding author. Universidade de São Paulo, Instituto de Eletrotécnica e Energia, Avenida Professor Luciano Gualberto, 1289-Cidade Universitária, CEP 05508-010, Butantã, São Paulo SP, Brasil. Fax: +551130912653.

E-mail address: bun2@tsp.com.br (J.R. Moreira).