As environmental impacts and resource depletion are serious concerns for the modern society, they also provide the motivation and need to design processes that are not only economically and operationally feasible, but also environmentally friendly. In this respect, life cycle assessment (LCA) is a tool for quantifying potential environmental impacts throughout the life cycle of the product or process. It can be used in conjunction with an economic tool to evaluate the design of any existing and/or new chemical-biochemical process and create improvement options in order to arrive at the best design among various alternatives. Although there are several commercial LCA software, there is still need to for a simple LCA software that can be integrated with process design tools. The objective of this paper is to present a new LCA software, LCSoft, which is exclusively designed for chemical-biochemical processes and integrated with other design tools. LCSoft has the following highlights: (1) database of collected environmental properties and other parameters needed for calculation of LCA indices and environmental impacts; (2) a group contribution+ method (GC+) for the accurate estimation of environmental factors; (3) integration with an economic analysis software, ECON; (4) integration with sustainable process design software, SustainPro; and, (5) efficient and systematic work-flow for the calculation of impacts and assessment parameters. LCSoft has been tested on several chemical and biochemical processes. In this paper, the application of LCSoft to the analysis of the NREL bioethanol process will be presented and compared with other LCA based software.