Life Cycle Assessment or LCA is a technique to evaluate environmental impacts through the entire life cycle of products and/or processes, which is an important key to identify the environmental hotspot and make more informed decision for process design. In order to perform LCA, LCSoft has been developed with ability to integrate with other process design tools such as process simulation software, economic analysis tool, and sustainable process design tool. In addition, several optional interpretation features are available, such as, sensitivity analysis, alternative comparison, and eco-efficiency evaluation. More specifically in this paper, LCSoft has been improved in terms of performance and application range. The development framework consists of four tasks. The first task deals with a new pathway for LCIA calculation to improve the flexibility of the software. The second task consists of extension and management options of Life Cycle Inventory database. The third task deals with development & introduction of new LCSoft features - parameter sensitivity analysis, normalization, and data quality indicator. The final task is validation of the integrated software. In this paper, assessment results for bioethanol production from cassava rhizome are compared with LCA software, SimaPro. The results indicate that the new features of LCSoft provide reliable calculations very efficiently, and are especially useful for chemical and biochemical sustainable process design studies.