Life Cycle Assessment of Thai Shrimp

Rattanawan Mungkung

Department of Environmental Science, Faculty of Science, Kasetsart University, P.O. Box 1072 Kasetsart, Chatuchak, Bangkok 10903, Thailand (Phone: +66 2 942 8036 ext. 119, Fax: +66 2 942 8715, E-mail: fscirwm@ku.ac.th)

Abstract

Shrimp is a key product generating significant foreign revenue and enormous social benefits to Thailand. On the other hand, shrimp aquaculture activities have attracted a great deal of criticism related to their environmental impacts. Coupled with the increasing consumer demand for certified or eco-labelled shrimp products, the environmental declaration of shrimp product has become essential. These issues have also raised serious concerns over the sustainability of shrimp aquaculture production as well as consumption. Thus, this study took a life cycle approach to assess the environmental sustainability of shrimp aquaculture from “cradle to grave” using a block-frozen shrimp product as the case study. The life cycle activities considered in the study are: wild broodstock trawling; culturing of shrimp larvae at hatchery; culturing of post-larvae to adult shrimps at farm; shrimp processing; distribution; waste management and sewage treatment; and transport in all life cycle stages. The foreground data were collected from trawlers, hatcheries and farms based on the production cycle in 2003, supplemented by available literature and databases. The environmental impacts assessed in this study were the standard impact categories based on the CML2 Baseline 2000 method. The LCA results showed that farming is the key life cycle stage generating the most significant impacts particularly on global warming, abiotic depletion and marine toxicity which arise mainly from the use of energy (for operating aerators), production of shrimp feed and application of burnt lime (for adjusting pH). Wastewater discharged from shrimp ponds for harvesting has also been identified as a major contributor to eutrophication problem. The comparative LCA results of five different farming systems have indicated that the potential impacts are linked to the choice of farming site, culturing technique, pond and farm management strategies applied. By using the LCA results to evaluate the current certification systems (“Code of Conduct for Responsible Shrimp Aquaculture” or “CoC”), the principles and criteria identified provide a more comprehensive perspective on the environmental impacts, covering both upstream and downstream activities as well as local and global impacts. Moreover, the possible environmental criteria for labelling shrimp aquaculture products could be: the amount of energy consumed for shrimp farming, the proportion of fishmeal in shrimp feed, the quantity of burnt lime used for pond management, and the nutrient loading of wastewater discharged from shrimp ponds. This study has demonstrated that LCA can be a useful tool to inform and facilitate the move towards a more sustainable production-consumption system.

Keywords: Life Cycle Assessment (LCA); shrimp aquaculture; Thailand