Wannipa Suksathit 2008: Comparative Life Cycle Assessment of Pacific White Shrimp (*Litopenaeus vannamei*) Feed Using Fishmeal or Soymeal as the Main Ingredient. Master of Science (Environmental Technology and Management), Major Field: Environmental Technology and Management, Department of Environmental Science. Thesis Advisor: Ms.Rattanawan Mungkung, Ph.D. 110 pages.

Life Cycle Assessment (LCA) was applied as the analytical tool to systematically evaluate the environmental consequences of using soymeal as an attempt to reduce the use of fishmeal in shrimp feed. The analysis included production of feed materials, feed production processing, feed used at shrimp farms, and transport in all stages. The inventory data were collected from a feed mill and several shrimp farms during March 2006 to July 2007, supplemented by available databases and published data. The amount of feed required for producing one ton of shrimp was used as a basis for comparison two different feeds using fishmeal or soymeal as the main ingredient (shrimp feed 1; fishmeal : soymeal = 34 : 17 and shrimp feed 2; fishmeal : soymeal = 25 : 22). The impact assessment methods used were the CML2 baseline 2000 (version 2.03) and Cumulative Energy Demand (version 1.03). The potential impacts of fishmeal-based feed on global warming, acidification, eutrophication, net primary production use, land use and energy use were 3,580 kg $CO_2$ eq., 31.5 kg $SO_2$ eq., 55.9 kg $PO_4^{-3}$ eq., 53,900 kg C, 1,349 $m^2$.year and 53,900 MJ-eq. respectively whereas those for soymeal-based feed were 2,840 kg $CO_2$ eq., 29.4 kg $SO_2$ eq., 75 kg $PO_4^{-3}$ eq., 33,000 kg C, 1,226 $m^2$.year and 54,600 MJ-eq. respectively. The LCA results indicated that the soymeal-based feed potentially generated higher impacts on energy use and eutrophication but lower impacts on global warming, acidification, land use and net primary production use. The higher impact energy use was mainly due to transport of imported soymeal and wheat; the higher eutrophication was associated with lower digestibility of soymeal and wheat leading to higher nutrient loading in the discharge water. The contary, the higher impacts of fishmeal-based feed on global warming and acidification were the consequences of $N_2O$, $CO_2$ and $SO_2$ emissions from transport of soymeal. It also caused higher impact on land use because of the higher land are required for soybean and wheat production. The higher impact on net primary production use was due to the high carbon content of trash fish used for fishmeal production. For environmental improvement, local feed materials should be used as well as the energy efficiency of feed processing would be considered. It should be noted that the magnitude of impacts are very much dependent on the level of inputs and farming practice such as stocking density, survival rate, water exchange during culturing period and feeding management.

Wannipa Suksathit — Student's signature

Thesis Advisor's signature — 02 / 06 / 08