

Thitikorn Chupairote 2009: Life Cycle Assessment of Cotton Shawl for Eco-Labeling. Master of Science (Environmental Technology and Management), Major Field: Environmental Technology and Management, Department of Environmental Science. Thesis Advisor: Ms. Rattanawan Mungkung, Ph.D. 197 pages.

Due to a great concern over the environmental issues associated with the whole supply chain of a hand-woven cotton product as well as the development of eco-labelled products to enhance competitiveness in markets, a Life Cycle Assessment (LCA) study were conducted. The studied products were piece-dyed, conventional cotton shawl (100% conventional cotton fibres) and organic cotton shawl (85% organic cotton fibres and 15% conventional cotton fibres). The functional unit for the LCA study was set as 1,170 sheets of 90 cm x 200 cm cotton shawl dyed with natural or chemical dyes (assuming a life span of 2 years, 4 washes per year using washing machine and detergent). The studied sites were 4 main production community enterprises in the North in Lampang and Chiang Mai provinces. The result of impact assessment using the CML2 baseline 2000 (CML), Cumulative Energy Demand (CED) and Environmental Design of Industrial Products (EDIP) indicated that the potential impacts of the conventional cotton shawl were global warming 1,965 kg CO₂ eq., human toxicity 389 kg 1,4-DB eq., acidification 8.86 kg SO₂ eq., eutrophication 4.46 kg PO₄³⁻ eq., land use 7,805 m².year and energy use 2,817 MJ eq. whereas those for organic cotton were global warming 688 kg CO₂ eq., human toxicity 113 kg 1,4-DB eq., acidification 2.58 kg SO₂ eq., eutrophication 4.17 kg PO₄³⁻ eq., land use 48,350 m².year and energy use 4,110 MJ eq. The contribution analysis results showed that cotton cultivation stage is the key stage significantly contribute to the impacts especially from the fertilizer production processing that resulted in emissions of hydrogen fluoride and sulphur dioxide to air and discharge of phosphate to water while global warming potential impact results mainly from electricity use during spinning process. The comparative environmental performance indicated that organic and naturally-dyed cotton shawl by using makuea (*Diospyos mollis* Griff) has the lowest impacts, because the fertilizer was not applied and has higher productivity than others. The LCA results were used to compare against the criteria of “Thai Green” and “EU Flower” labels. It was found that organic cotton shawls were in compliance with the Thai Green Label’s requirements on the pH level of cotton fibres and heavy metal residues, while both of conventional and organic cotton shawls were in compliance with the EU Flower Label’s requirements on limited pesticides on cotton fibres and no use of prohibited auxiliary chemicals. However, the Chemical Oxygen Demand level of wastewater from dyeing processes of both conventional and organic cotton shawls discharged without treatment was higher than 25 g/kg and azo dyes were still used. Thus, wastewater should be treated before discharging into natural receiving water, and azo dyes must not be used.

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Thesis Advisor’s signature

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